AMERICAN
STATISTICAL ASSOCIATION

NEW SERIES, No. 127. SEPTEMBER, 1919

RETAIL PRICES OF FOOD DURING 1917 AND 1918.

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The United States had been technically at war for some months when Congress, in August, 1917, enacted a law "to further provide for the national security and defense by encouraging the production, conserving the supply and controlling the distribution of food products and fuel." Under authority of the act referred to the President created the United States Food Administration and appointed Mr. Herbert Hoover to the supervision and direction of its functions.

The law was comprehensive in its purposes and the functions of the Food Administration in its war-time activities were wide. To safeguard the public interests and insure an efficient administration, the law provided certain regulations restricting many business and commercial practices with which in times of peace the government had not interfered. The President was authorized to license certain kinds of business and to prescribe regulations and practices for systems of accounts and auditing of accounts of licensees; to require the submission of reports by them; the discontinuance of unfair, unjust, discriminating, unreasonable practices, and the entry and inspection of licensees, places of business by authorized agents. Agricultural producers were excepted from the operation of these requirements of the law as were also retailers of products who were not engaged in the wholesale business and whose gross sales did not exceed $100,000 per annum. Severe penalties were provided for the violation of many of these regulations.

Because of the somewhat unique character of the retail price work of the Statistical Division of the Food Administration it seems desirable to make a permanent record of the summarized results of this line of activity. The outstanding difference between the retail price reporting of the Food Administration and ordinary statistics of such prices lay in the fact that the Food Administration's prices were the prices actually paid by actual consumers, and directly reported by them weekly. The data passed through no intermediate hands interested in the trade.

Though not a mandatory requirement of the Act, one of the fundamental purposes of the Food Administration was to do everything possible to regulate and keep the retail prices of staple articles of food at a minimum to the consumer. The law, as already stated, did not apply to the operations of retailers whose annual gross sales were less than $100,000, but it was possible to control their prices in no small degree through the direct control which the Food Administration had over licensees. It was planned to keep a close watch of retail prices with the aid of volunteers from among the consumers themselves, through a scheme of weekly reports from a selected number of reliable people in every town and city of 3,000 or more inhabitants. A supply of blank forms, printed and designed for the purpose of conveniently making reports of the current prices of twenty-eight staple food articles charged in his or her respective community on a fixed day of the week, was sent to each of such volunteer reporters. Pursuant to arrangements made with these consumer-reporters, the blanks, properly filled in with the desired data, were regularly mailed back to the Food Administration each week.

The intention in inaugurating this work was to supplement, for reasons of administrative necessity in the Food Administration, the retail price reports of the Bureau of Labor Statistics, in respect of the following points:

1. Wider area.
2. More comprehensive list of foods.
3. More frequent intervals (weekly instead of monthly).
4. Reports from consumers instead of dealers.

Valuable assistance in obtaining these volunteer reports

was initially rendered by the Comptroller of the Currency, who sent out to the banks of the country a circular statement of the plan, accompanied by a request that officials and employees of the banks interest themselves in securing the services of one or more volunteer reporters in their respective communities. Aid in securing reliable reporters was also furnished by other persons and officials, including the Food Administrators in the several states. These methods brought very gratifying results both in the number and character of the reporters.

The duties of the volunteer reporters were to visit personally representative grocery stores in their vicinity and obtain the retail prices at which these stores were selling the selected food staples each week. The prices thus ascertained were carefully entered on the forms supplied and then regularly and promptly mailed to the Food Administration. In the majority of cases the prices reported were those taken by the reporter from her own sales slips of goods she had actually purchased.

Promptly after the first week's reports had been received from the reporters in October, 1917, the "Retail Prices" Section of the Statistical Division began the work of assembling the data and tabulating the results. With equal promptitude it prepared a weekly bulletin setting forth these results, accompanied by a study of them. This became the routine work of the section, which grew in volume with the number of reporters and the amplification of the detailed data furnished by them.

The Canadian Food Administration had established a similar retail price collecting service and sometime after the establishment of our service an arrangement was entered into with the Canadian Administration for an exchange of reports. Thereafter the prices reported in the Canadian provinces were included in our weekly and periodical reports. The Canadian price figures, when differently reported, were reduced to the equivalent of prices in our units. Later the work of the section was increased by the preparation of monthly and quarterly reports, in addition to which special reports were from time to time prepared to serve the needs of other governmental officials or bureaus.

From a few clerks and stenographers, the clerical organization engaged in the collection, assembling, and tabulation of the data pertaining to retail prices, grew and expanded until at the time when the work was discontinued the personnel of this branch consisted of about thirty-five people. Its work was constant and often exacting, but the *esprit de corps*, loyalty and enthusiasm of the employees of this branch was probably not excelled by that of any other assemblage of war workers which the emergency drew together in Washington.

For reasons which, in the judgment of the Food Administration, rendered it improper or inexpedient to give full publicity to the retail price data, only limited dissemination of them was made. This was done through the issuance of the regular weekly mimeographed bulletin or through the quarterly and other occasional bulletins. The distribution of these bulletins was never extended to others than heads of the Food Administration in Washington and the State Food Administrators.

Though this division of the Food Administration constantly dealt with specific and definite data and its reports were always expressed in dollars and cents, it is obvious that the results on control of retail prices to the consumer cannot be thus definitely expressed or shown. To those who have had to do with these things, however, either in Washington or in the several states, it is well known that the work of the Food Administration along these lines was highly beneficial and effective in limiting the exaction of excessive prices by the local retailer. Had the Food Administration been invested with wider and more far reaching powers it would have probably been practicable at all times to keep retail prices within reasonable limits. There is abundant testimony in the files of the Food Administration to support this assertion.

The first weekly reports received were for the week of October 6, 1917, when reports were received from 839 reporters representing 798 towns and cities. On September 28, 1918, which marked the close of a year of fifty-two weeks, the work had so increased that reports were received from 1,871 reporters representing 1,305 towns and cities.

The number of reports received, and the number of different cities and towns from which they came are exhibited, for each week during the continuance of the service, in Table A.

TABLE A.

STATEMENT SHOWING NUMBER OF REPORTS RECEIVED AND CITIES AND TOWNS REPRESENTED IN SUCH REPORTS, FOR EACH WEEK FROM OCTOBER 6, 1917 TO DECEMBER 28, 1918.

Week ending	Number of reports	Number of cities and towns	Week ending	Number of reports	Number of cities and towns
1917			1918		
Oct. 6	839	798	May 4	1,795	1,283
13	1,003	815	11	1,881	1,328
20	1,033	826	18	1,948	1,330
27	1,071	805	25	1,918	1,292
Nov. 3	1,029	801	June 1	1,900	1,350
10	1,076	844	8	2,076	1,376
17	1,096	841	15	1,936	1,313
24	1,238	837	22	2,037	1,365
Dec. 1	1,226	904	29	2,103	1,429
8	1,324	990	July 6	2,023	1,386
15	1,479	1,116	13	2,017	1,386
22	1,324	1,027	20	2,012	1,395
29	1,351	1,082	27	2,026	1,387
1918					
Jan. 5	1,461	1,146	Aug. 3	2,021	1,393
12	1,681	1,238	10	1,993	1,369
19	1,746	1,286	17	1,957	1,328
26	1,913	1,412	24	1,957	1,336
Feb. 2	1,871	1,376	31	1,859	1,312
9	1,894	1,373	Sept. 7	1,924	1,353
16	1,875	1,345	14	1,855	1,332
23	1,873	1,394	21	1,859	1,308
Mar. 2	1,836	1,350	28	1,871	1,305
9	1,833	1,338	Oct. 5	1,906	1,405
16	1,846	1,360	12	1,842	1,299
23	1,859	1,431	19	1,857	1,303
30	1,943	1,420	26	1,879	1,325
Apr. 6	1,907	1,357	Nov. 2	1,803	1,273
13	1,915	1,371	9	1,686	1,205
20	1,846	1,291	16	1,604	1,155
27	1,740	1,341	23	1,710	1,124
			30	1,710	1,229
			Dec. 7	1,773	1,293
			14	1,744	1,256
			21	1,463	1,021
			28	1,400	1,030

The utmost pains were taken to ensure the accuracy of the individual reports. Whenever the price returned for a particular article seemed too high or too low, in comparison with other reports from the same or nearby localities, the report was returned for correction or verification and explanation. By this system it is believed that the finally accepted reports had a high degree of accuracy.

The Canadian prices represent reports from fifty-eight cities. Comparison with Canadian prices is impracticable on all articles for which prices are quoted in the United States, either because no prices were quoted by Canada on certain commodities, or if quoted, were quoted on unit bases not readily reduced to the United States unit.

Canada potato prices are omitted because the seasonal production of potatoes in Canada varies so greatly from that in many parts of the United States that it is impracticable to make reliable comparisons.

This report presents statistics for the selected commodities as follows:

Table I—Analysis, by states, of the *highest* and *lowest* average retail prices on 15 of the principal food staples, showing the states quoting *highest* and *lowest* prices the greatest number of weeks, together with the average prices in the United States.

Table II—A comparison for the week ending October 6, 1917, with the week ending September 28, 1918, of average prices on 28 staple foods in the United States and on 22 in Canada, showing also the absolute and percentage increases and decreases in such prices for the year.

Table III—Quarterly averages of prices, together with the yearly averages, for the period beginning with the week ending October 6, 1917, and ending September 28, 1918, on 28 staple food articles in the United States.

Table IV—Statement showing average retail prices on 28 staple food articles in the United States for each month, from October, 1917, to September, 1918, together with the aggregate prices and monthly percentage increases or decreases on all articles combined.

Table V—Statement showing average retail prices for each week from October 6, 1917, to September 28, 1918, on 28 staple food articles in the United States and on 22 in Canada.

Table VI—Statement showing average and relative weekly prices in the United States on 8 selected commodities, beginning with the week ending October 6, 1917, and ending September 28, 1918. (The base period equals the average of October prices taken as 100.)

Table VII—Statement showing average retail prices for each week from October 5, 1918, to December 28, 1918, on 28 staple food articles in the United States and on 22 in Canada.

Analysis by States of the Highest and Lowest Prices on Fifteen of the Principal Food Staples (Table I).

The highest quotation during the year for a 1-16 bbl. bag of wheat flour was reported by Connecticut, at 95 cents, and the lowest price by Utah, at 64.7 cents. Wheat flour was highest in Florida 21 of the 52 weeks in the year; and lowest in Utah, 32 weeks. The price of a pound loaf of bread was highest in Montana and Nevada, 18 weeks each; and lowest in the District of Columbia, 23 weeks. Cornmeal was highest in Nevada for 34 weeks and lowest in Alabama and Tennessee 25 and 26 weeks, respectively.

The compilation of states reporting highest and lowest meat prices the greatest number of weeks during the year, shows that Nevada reported the highest price on bacon, 21 weeks; Massachusetts and Rhode Island on round steak, 20 and 31 weeks, respectively; and Arizona and the District of Columbia, 13 and 24 weeks, respectively, on pork chops. During the yearly period, Wisconsin and New Hampshire reported the lowest bacon prices, 14 and 21 weeks, respectively; Oregon was lowest on round steak, 44 weeks; and Wisconsin lowest on pork chops, 29 weeks.

Milk has been consistently highest in the southern states, Alabama reporting the highest price for the year, and South Carolina the highest average weekly price the greatest number of times. Wisconsin and South Dakota showed lowest prices 19 and 23 weeks, respectively. Of the other dairy products, butter was highest in Nevada, 15 weeks; cheese in New Mexico, 23 weeks; and eggs in Connecticut, 21 weeks.

Butter was lowest in North Dakota, 34 weeks; cheese in Wisconsin, 15 weeks; and eggs in South Dakota, 21 weeks. The highest price for oleomargarine was quoted from Wyoming, and the lowest from Texas.

West Virginia reported the highest sugar quotations for 10 weeks and Nevada for 20 weeks; lowest sugar prices were reported in the District of Columbia and California, 21 weeks each.

Potatoes were also uniformly highest in the South and lowest in the Western Mountain states. Georgia and South Carolina reported the highest prices the greatest number of times; and Utah and Idaho, the lowest.

An outstanding fact in Table I, is that Nevada quoted highest prices of the year on four commodities: bacon, butter, cheese and rice; and is one of the states quoting the highest price 10 or more weeks on the following commodities: on wheat bread, 18 times; cornmeal, 34 times; sugar, 20 times; bacon, 21 times; lard, 18 times; butter, 15 times; oleomargarine, 10 times; cheese, 10 times; and on rice, 13 times.

Summary of Changes in Retail Prices for the Year (Table II).

During the yearly period from the week ending October 6, 1917, to September 28, 1918, 22 commodities increased and 6 decreased in the United States. In Canada, during the same period, 19 commodities increased and 3 decreased. With the exception of milk and fish, all of the comparable commodities which increased in the United States also increased in Canada. The rate of increase was greater in Canada than in the United States upon all of these commodities, except the following five which were greater in the United States: butter, by 15 per cent.; steak, by 9.6 per cent.; cheese, by 4 per cent.; eggs, by 1.9 per cent.; and bacon, by 1.3 per cent. Noticeable percentage increases in the United States were indicated on potatoes, 36.5; on round steak, 30.9; on sliced ham, 28.2; on rice, 24.8; on hens, 24.4; and on butter, 21.1. Increases of over 10 per cent. were also noted on bacon, pork chops, milk, oleomargarine, canned salmon and fresh fish; and of less than 10 per cent. on lard, eggs, cheese, the canned vegetables, onions, sugar, tea and prunes. The decreases were on wheat flour, wheat bread,

cornmeal, oatmeal, beans and coffee. The greatest percentage increase in Canada was on rice, 31.5. Large percentages of increase were also shown on canned corn, 29.6; peas, 26.3; salmon, 25; tomatoes, 20.6; tea, 23.5; oatmeal, 23.1; steak, 21.3; pork chops, 18.8; and bacon, 18.6. Increases of more than 10 per cent. were noted on lard, prunes, sugar and coffee. Increases of less than 10 per cent. were on bread, butter, cheese, eggs, and beans. Wheat flour, milk and fish decreased in price.

In the United States the price per 1-16 bbl. bag of wheat flour (Table II) decreased 3.2 cents during the year, being 86.9 cents, the highest price for the whole year, on October 6, 1917, and 83.7 cents on September 28, 1918. In Canada the price of wheat flour, per 1-16 bbl. bag, decreased 1.9 cents, being 83.4 cents on October 6, and 81.5 cents on September 28.

The decreases noted in the United States were 10.7 per cent. on coffee, 9.2 per cent. on wheat bread, 9.1 per cent. on beans, 5.6 per cent. on bulk oatmeal, 3.7 per cent. on wheat flour, and 2.9 per cent. on cornmeal. The decreases in Canada were on wheat flour, milk and fish; they were all less than 4 per cent.

The aggregate cost of the commodities in the United States, for the unit measures quoted, was $8.01 on October 6, 1917, and $8.90 on September 28, 1918. The combined cost of these foodstuffs increased 89 cents, or 11.1 per cent. in a year in the United States and 75.7 cents or 12.3 per cent. in Canada.

Quarterly Averages for the Year (Table III).

The price quotations in Table III are quarterly averages, obtained by calculating an average of the thirteen weekly averages in each quarter for each commodity. This table also shows percentage changes from quarter to quarter and the aggregates of the twenty-eight commodities for each quarter.

Of the cereals and cereal products, wheat flour quotations were highest in the first and last quarters of the year; wheat bread prices decreased in each quarter; cornmeal showed the same average in the first three quarters and decreased slightly in the last quarter; oatmeal fluctuated in price, being slightly less in the fourth quarter than in the first; and rice increased steadily in each quarter.

With the exception of pork chops, which decreased in the

second quarter, each quarter showed an increase over the previous quarter in all of the meats listed, the greatest percentage increases being in the last quarter over the third, except for round steak which increased 16.7 per cent. in the third and 8.3 per cent. in the fourth quarter. In the last quarter bacon increased 5.6; ham, 9.5; and pork chops 10.1 per cent.

The average price of milk increased slightly in each quarter, except the third; butter prices increased, except in the third quarter, which showed a decline attributable to seasonal influence; average retail prices of eggs fluctuated, but wholly by reason of seasonal supply and demand; the prices of oleomargarine indicate a similar trend to butter.

Sugar decreased in the second and third quarters and increased in the fourth.

The canned goods all show slight increases in the last quarter over the first, but canned salmon shows an increase in each quarter, the greatest being in the fourth quarter.

The aggregate of the twenty-eight foodstuffs shows increases for each quarter except the third. The decrease in the third quarter, April 6 to June 29, is due mainly to the seasonal decline in the dairy products.

Monthly Averages for the Year (Table IV).

Table IV gives prices of 28 staple food articles, month by month, from October, 1917, to September, 1918. The monthly price is made up of four or five weekly prices, the deciding factor as to the month in which a certain week's price belongs being the majority of that week's days in the month.

The aggregate cost of the twenty-eight commodities was highest for the month of September, 1918, at $8.787 and lowest for the month of April at $7.985. The greatest percentage of increase in price is shown in July and the greatest percentage of decrease in March. Only in three months are decreases shown in comparison with the preceding months—February, March and April.

Between October, 1917, and September, 1918, 21 commodities show increases and 7 decreases. The greatest percentage increases are on the following: Potatoes, 32.5; round steak,

30; ham, 24.3; hens, 23.6; rice, 22.7; bacon, 15.3; and pork chops, 14.1. The prices which were lower in September, 1918, than in October, 1917, were wheat flour, wheat bread, cornmeal, oatmeal, navy beans, prunes, and coffee. The total increase in the month of September, 1918, over the month of October, 1917, in the combined cost of these commodities was 71.3 cents or 8.8 per cent.

Summary of Changes in Retail Prices for the Year, Considered Week by Week (Tables V and VI).

Examination of Table V reveals the fact that in the United States no article shows a continuous rise or fall during the entire period. Sugar declined more steadily, week by week, until the last quarter, and rice increased more steadily than any other commodity.

Of the eight articles for which relative prices are given in Table VI, all show increases except cornmeal. A general downward trend until February 16 is shown in the price of wheat flour, the highest relative figure being 102.5 on October 6 and the lowest 96 on February 9 and 16. For 8 weeks, beginning April 13, the relative figure remained the same, 97.2, and from then most weeks showed an increase until the end of the term. Cornmeal figures were very steady for the entire period. For 18 weeks of the time reported, the relative figure remained 100. In only one week of the year did this commodity vary more than one mill or differ more than 2 mills in any one week from the average for the year. Rice exhibited an almost steady increase from the lowest relative price of 99.1 on October 6 and 13, to the highest relative price of 123.6 on September 21 and 28. From October 27 until July there was a decline in the price of potatoes. A marked increase in price is noted the first week in July, when new potatoes were quoted, as they formed the bulk of the sales. Part B, of Table VI, shows prices for round steak, bacon, pork chops and lard. The meats fluctuated somewhat during the first two quarters and steadily increased the latter two quarters. The ratio of increase was greatest on round steak, the relative price being 99.3 on October 6 and 130 on September 28, an increase of 31 per cent. The next largest meat increase was on bacon, from 97.9 on October 6 to a

relative price of 117.4 on September 28, or 20 per cent. Pork chops increased 17 per cent. and lard 9 per cent.

Quarterly Report on Retail Prices for Each Week from October 9 to December 28, 1918 (Table VII).

Table VII is a compilation of average retail prices for each week of the quarter, beginning with the week ending October 5, and ending December 28, 1918, and covers the last three months of weekly reports on retail prices. The figures are not included in the report for the year, which is covered by Table V.

The number of reporters quoting prices for the United States on December 28, was 1,400 and represented 1,030 cities. The comparison of Canadian food prices with those of the United States was discontinued on December 14, as, from that date, the Canadian prices were not forwarded weekly to the Food Administration.

During this period from October 9 to December 28, prices declined in the United States on 11 of the articles listed, increased on 17, and remained the same on 1. The articles which decreased in price were wheat flour, cornmeal, oatmeal, steak, pork chops, lard, potatoes, beans, onions and hens. The increases were shown on rice, bacon, ham, milk, butter, oleomargarine, cheese, eggs, sugar, prunes, canned tomatoes, peas, corn, salmon, fish, tea and coffee. Wheat bread was the same price on October 6 and December 28.

Conclusion.

The purpose of this paper is solely to put on record data which may be useful to the future economic historian who wishes to study the course of retail food prices in the United States during our participation in the Great War. The time has probably not come yet for the writing of such a history. In any event the present authors are not economists and have no intention of invading a field so beset with pitfalls for the unwary. What is here presented is simply a record of a certain group of facts, believed to be substantially accurate. A careful study of them will show in many striking ways the almost immediate effect of regulations promulgated by the Food Administration.

TABLE I.

STATEMENT SHOWING ON 15 SELECTED COMMODITIES FOR THE YEAR, FROM THE WEEK ENDING OCTOBER 6, 1917, TO SEPTEMBER 28, 1918, THE *HIGHEST* AND *LOWEST* AVERAGE RETAIL PRICES AND THE STATES REPORTING SAME, THE STATES QUOTING *HIGHEST* AND *LOWEST* AVERAGE PRICES THE GREATEST NUMBER OF TIMES, TOGETHER WITH THE AVERAGE PRICES FOR THE UNITED STATES.

Commodities	General average retail prices for the year in the United States	*Highest* State Average Price				*Lowest* State Average Price			
		For any one week		Quoted greatest number of times		For any one week		Quoted greatest number of times	
		State	Price	State	Number of times	State	Price	State	Number of times
Wheat flour.....(1/16 bbl. bag)	$.831	Connecticut.....	$.950	Mississippi.....	11	Utah.....	$.647	Idaho.....	22
				Florida.....	21			Utah.....	32
Wheat bread.....(lb.)	.102	Arizona.....		Montana.....	18	District of		District of	
		No. Dakota.....	.150	Nevada.....	18	Columbia....	.070	Columbia....	23
				Montana.....	9			Georgia.....	9
								Alabama.....	25
Cornmeal, bulk.....(lb.)	.067	Louisiana.....	.113	Nevada.....	34	Tennessee.....	.045	Tennessee.....	26
				Massachusetts...	20				
Steak, round.....(lb.)	.329	Rhode Island....	.537	Rhode Island....	31	Oregon.....	.215	Oregon.....	44
				Arizona.....	9			Wisconsin.....	14
Bacon, sliced.....(lb.)	.498	Nevada.....	.637	Nevada.....	21	Florida.....	.395	New Hampshire	21
				Arizona.....	13				
		District of		District of					
Pork chops.....(lb.)	.363	Columbia.....	.550	Columbia.....	24	Florida.....	.281	Wisconsin.....	29
Lard.....(lb.)	.329	New Mexico.....	.400	Nevada.....	18	Oklahoma.....	.283	New Mexico...	9
				Florida.....	15			Wisconsin.....	19
Milk.....(qt.)	.126	Alabama.....	.180	So. Carolina.....	18	Utah.....	.088	So. Dakota....	23

TABLE I—(*Continued*).

STATEMENT SHOWING ON 15 SELECTED COMMODITIES FOR THE YEAR, FROM THE WEEK ENDING OCTOBER 6, 1917, TO SEPTEMBER 28, 1918, THE *HIGHEST* AND *LOWEST* AVERAGE RETAIL PRICES AND THE STATES REPORTING SAME, THE STATES QUOTING *HIGHEST* AND *LOWEST* AVERAGE PRICES THE GREATEST NUMBER OF TIMES, TOGETHER WITH THE AVERAGE PRICES FOR THE UNITED STATES.

Commodities	General average retail prices for the year in the United States	*Highest* State Average Price				*Lowest* State Average Price			
		For any one week		Quoted greatest number of times		For any one week		Quoted greatest number of times	
		State	Price	State	Number of times	State	Price	State	Number of times
Butter.....(lb.)	$.526	Nevada.....	$.703	Arizona.....	11	No. Dakota ...	$.382	No. Dakota ...	34
				West Virginia ...	13				
				Nevada.....	15			Rhode Island..	13
Oleomargarine.....(lb.)	.352	Wyoming	.475	Nevada.....	10	Texas	.200	District of Columbia ...	24
				Oregon	11				
				So. Carolina.....	11			New Hampshire	10
Cheese.....(lb.)	.350	Nevada.....	.436	Nevada.....	10	Wisconsin.....	.297	Utah.....	11
				West Virginia ...	14			Wisconsin.....	15
				New Mexico.....	23				
Eggs.....(doz.)	.476	Connecticut.....	.838	Massachusetts...	10	Oklahoma.....	.260	No. Dakota ...	13
				Rhode Island....	20			So. Dakota....	21
				Connecticut.....	21				
Sugar.....(lb.)	.096	Montana.....	.116	West Virginia ...	10	Alabama.....	.082	District of Columbia ...	21
				Nevada.....	20			California.....	21
				Georgia.....	13				
Potatoes.....(pk.)	.453	No. Dakota	.800	So. Carolina.....	14	Utah.....	.153	Idaho.....	16
				West Virginia ...	9			Louisiana.....	12
				Nevada.....	13			California.....	14
Rice.....(lb.)	.120	Nevada.....	.155	Montana.....	15	West Virginia .	.090	Utah.....	17

TABLE II.

A COMPARISON OF AVERAGE RETAIL PRICES FOR THE WEEK ENDING OCTOBER 6, 1917, WITH THOSE FOR THE WEEK ENDING SEPTEMBER 28, 1918, ON 28 STAPLE FOODS IN THE UNITED STATES AND ON 22 IN CANADA, TOGETHER WITH THE INCREASES AND DECREASES FOR THE YEAR.

Commodities	United States				Canada			
	Week ending		Increases (+) or decreases (−)		Week ending		Increases (+) or decreases (−)	
	Oct. 6 1917	Sept. 28, 1918	Absolute	Per cent	Oct. 6 1917	Sept. 28, 1918	Absolute	Per cent
Wheat flour (1/16 bbl. bag)	$.869	$.837	$−.032	−3.7	$.834	$.815	$−.019	−2.3
Wheat bread...(lb.)	.109	.099	−.010	−9.2	.072	.079	+.007	+9.7
Cornmeal, bulk.(lb.)	.068	.066	−.002	−2.9	*	*	*	*
Oatmeal, bulk..(lb.)	.089	.084	−.005	−5.6	.065	.080	+.015	+23.1
Rice.....(lb.)	.109	.136	+.027	+24.8	.092	.121	+.029	+31.5
Steak, round...(lb.)	.291	.381	+.090	+30.9	.286	.347	+.061	+21.3
Bacon, sliced...(lb.)	.462	.554	+.092	+19.9	.451	.535	+.084	+18.6
Ham, sliced....(lb.)	.397	.509	+.112	+28.2	*	*	*	*
Pork chops....(lb.)	.368	.430	+.062	+16.8	.355	.398	+.063	+18.8
Lard.....(lb.)	.308	.336	+.028	+9.1	.312	.369	+.057	+18.3
Milk.....(qt.)	.116	.133	+.017	+14.7	.105	.101	−.004	−3.8
Butter.....(lb.)	.511	.619	+.108	+21.1	.495	.525	+.030	+6.1
Oleomargarine..(lb.)	.324	.367	+.043	+13.3	*	*	*	*
Cheese.....(lb.)	.348	.368	+.020	+5.7	.302	.307	+.005	+1.7
Eggs.....(doz.)	.482	.529	+.047	+9.7	.514	.554	+.040	+7.8
Sugar.....(lb.)	.098	.102	+.004	+4.1	.106	.119	+.013	+12.3
Potatoes.....(pk.)	.419	.572	+.153	+36.5	*	*	*	*
Beans, navy...(lb.)	.187	.170	−.017	−9.1	.165	.168	+.003	+1.8
Onions.....(lb.)	.049	.053	+.004	+8.2	*	*	*	*
Prunes.....(lb.)	.171	.173	+.002	+1.2	.159	.183	+.024	+15.1
Tomatoes...(2 can)	.168	.173	+.005	+3.0	.141	.170	+.029	+20.6
Peas.....(2 can)	.175	.187	+.012	+6.9	.160	.202	+.042	+26.3
Corn.....(2 can)	.175	.183	+.008	+4.6	.189	.245	+.056	+29.6
Salmon.....(1 can)	.272	.308	+.036	+13.2	.264	.330	+.066	+25.0
Fish.....(lb.)	.227	.256	+.029	+12.8	.180	.174	−.006	−3.3
Hens.....(lb.)	.279	.347	+.068	+24.4	*	*	*	*
Tea.....(lb.)	.616	.640	+.024	+3.9	.493	.609	+.116	+23.5
Coffee.....(lb.)	.318	.284	−.034	−10.7	.405	.451	+.046	+11.3
Aggregates....	$8.005	$8.896	$+.891	+11.1	$6.125	$6.882	$+.757	+12.3

*Indicates commodities on which comparison of United States and Canadian prices is impracticable.

TABLE III.

YEARLY AND QUARTERLY AVERAGES OF RETAIL PRICES IN THE UNITED STATES, FOR THE YEAR ENDING SEPTEMBER 28, 1918.

Average price for:	Wheat flour 1/16 bbl. bag		Wheat bread lb.		Cornmeal, bulk lb.		Oatmeal, bulk lb.		Rice lb.	
	Absolute	Per* cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent
The year	$.829		$.102		$.067		$.087		$.120	
The quarters:										
1st. October 6 to December 29, 1917	.836		.106		.068		.088		.111	
2nd. January 5 to March 30, 1918	.821	−1.8	.102	−3.8	.068	.....	.088	.....	.116	+4.5
3rd. April 6 to June 29, 1918	.824	+0.4	.100	−2.0	.068	.....	.090	+2.3	.120	+3.4
4th. July 6 to September 28, 1919	.835	+1.3	.099	−1.0	.066	−2.9	.085	−5.5	.131	+9.2

Average price for:	Steak, round lb.		Bacon, sliced lb.		Ham, sliced lb.		Pork chops lb.		Lard lb.	
	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent
The year	$.329		$.498		$.437		$.363		$.329	
The quarters:										
1st. October 6 to December 29, 1917	.291		.478		.406		.356		.322	
2nd. January 5 to March 30, 1918	.299	+2.7	.488	+2.1	.417	+2.7	.344	−3.4	33.2	+3.1
3rd. April 6 to June 29, 1918	.349	+16.7	.499	+2.3	.441	+5.7	.358	+4.1	.331	−0.3
4th. July 6 to September 28, 1918	.378	+8.3	.527	+5.6	.483	+9.5	.394	+10.1	.331	.....

Average price for:	Milk qt.		Butter lb.		Oleomargarine lb.		Cheese lb.		Eggs doz.	
	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent
The year	$.126		$.526		$.352		$.350		$.476	
The quarters:										
1st. October 6 to December 29, 1917	.122		.516		.348		.350		.524	
2nd. January 5 to March 30, 1918	.127	+4.1	.546	+5.8	.355	+2.0	.354	+1.1	.527	+0.6
3rd. April 6 to June 29, 1918	.127	.....	.501	−8.2	.351	−1.1	.345	−2.5	.386	−26.7
4th. July 6 to September 28, 1918	.129	+1.6	.540	+7.8	.355	+1.1	.350	+1.4	.466	−20.7

*Per cent of increase (+) or decrease (−) compared with the preceding quarter.

TABLE III.—(*Continued.*)

YEARLY AND QUARTERLY AVERAGES OF RETAIL PRICES IN THE UNITED STATES, FOR THE YEAR ENDING SEPTEMBER 28, 1918.

Average price for:	Sugar lb.		Potatoes pk.		Beans, navy lb.		Onions lb.		Prunes lb.	
	Absolute	*Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent
The Year	$.096		$.453		$.179		$.052		$.169	
The quarters:										
1st. October 6 to December 29, 1917	.099		.440		.186		.051		.172	
2nd. January 5 to March 30, 1918	.096	−3.0	.426	−3.2	.182	−2.1	.052	+2.0	.169	−1.7
3rd. April 6 to June 29, 1918	.093	−3.1	.332	−22.1	.178	−2.2	.050	−3.8	.168	−0.6
4th. July 6 to September 28, 1918	.096	+3.2	.580	+74.7	.172	−3.4	.056	+12.0	.168	.....

Average price for:	Canned tomatoes No. 2 can		Canned peas No. 2 can		Canned corn No. 2 can		Canned salmon No. 1 can		Fish, fresh lb.	
	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent
The year	$.166		$.178		$.173		$.282		$.247	
The quarters:										
1st. October 6 to December 29, 1917	.165		.176		.174		.272		.235	
2nd. January 5 to March 30, 1918	.163	−1.2	.177	+0.6	.171	−1.7	.274	+0.7	.258	+9.8
3rd. April 6 to June 29, 1918	.165	+1.2	.177	.....	.172	+0.6	.281	+2.5	.246	−4.7
4th. July 6 to September 28, 1918	.169	+2.4	.181	+2.3	.177	+2.9	.301	+7.1	.251	+2.0

Average price for:	Hens lb.		Tea lb.		Coffee lb.		AGGREGATES	
	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent
The year	$.323		$.626		$.304		$8.239	
The quarters:								
1st. October 6 to December 29, 1917	.282		.621		.318		8.113	
2nd. January 5 to March 30, 1918	.319	+13.1	.626	+0.8	.315	−0.9	8.212	+.012
3rd. April 6 to June 29, 1918	.344	+7.8	.626	.....	.300	−4.8	8.022	−.023
4th. July 6 to September 28, 1918	.347	+0.9	.630	+0.6	.284	−5.3	8.581	+.070

* Per cent of increase (+) or decrease (−) compared with the preceding quarter.

TABLE IV.

A MONTHLY COMPARISON OF AVERAGE RETAIL PRICES IN THE UNITED STATES FOR THE YEARLY PERIOD, OCTOBER 1917 TO SEPTEMBER 1918, INCLUSIVE, ON 28 STAPLE FOOD ARTICLES.

Commodities	Average monthly prices*											
	1917			1918								
	October	November	December	January	February	March	April	May	June	July	August	September
Wheat flour.....(1/16 bbl. bag)	$.848	$.834	$.823	$.821	$.818	$.825	$.823	$.824	$.827	$.831	$.837	$.837
Wheat bread.....(16 oz.)	.108	.107	.103	.103	.102	.102	.100	.100	.100	.099	.099	.099
Cornmeal, bulk.....(lb.)	.068	.068	.068	.068	.068	.069	.069	.069	.066	.066	.066	.066
Oatmeal, bulk.....(lb.)	.089	.088	.087	.088	.087	.088	.091	.092	.086	.085	.085	.085
Rice.....(lb.)	.110	.111	.112	.114	.116	.113	.119	.119	.124	.128	.133	.135
Steak, round.....(lb.)	.293	.289	.289	.294	.299	.304	.323	.350	.375	.376	.376	.381
Bacon, sliced.....(lb.)	.472	.480	.485	.490	.491	.483	.491	.497	.509	.514	.527	.544
Ham, sliced.....(lb.)	.404	.406	.410	.415	.419	.419	.428	.437	.460	.469	.483	.502
Pork chops.....(lb.)	.369	.351	.346	.347	.343	.341	.349	.358	.368	.373	.394	.421
Lard.....(lb.)	.312	.325	.332	.332	.333	.332	.333	.332	.329	.328	.331	.335
Milk.....(qt.)	.118	.123	.126	.127	.127	.128	.127	.127	.126	.127	.129	.132
Butter.....(lb.)	.510	.511	.527	.547	.557	.533	.503	.500	.502	.515	.531	.579
Oleomargarine.....(lb.)	.343	.349	.353	.356	.358	.351	.352	.351	.350	.352	.354	.361
Cheese.....(lb.)	.350	.347	.352	.352	.356	.353	.349	.346	.341	.342	.349	.360
Eggs.....(doz.)	.493	.527	.561	.609	.554	.397	.383	.384	.391	.430	.467	.510
Sugar.....(lb.)	.098	.099	.098	.097	.096	.094	.093	.093	.093	.094	.095	.099
Potatoes.....(pk.)	.434	.449	.441	.444	.436	.392	.336	.322	.456	.595	.567	.575
Beans, navy.....(lb.)	.188	.185	.184	.184	.180	.182	.180	.178	.176	.173	.173	.171
Onions.....(lb.)	.051	.051	.052	.053	.053	.049	.045	.050	.055	.057	.057	.055
Prunes.....(lb.)	.173	.172	.170	.170	.169	.169	.169	.169	.164	.165	.168	.171
Tomatoes.....(No. 2 can)	.168	.165	.161	.162	.163	.165	.166	.167	.163	.166	.169	.172
Peas.....(No. 2 can)	.177	.176	.175	.177	.177	.175	.178	.178	.177	.178	.181	.185
Corn.....(No. 2 can)	.177	.173	.171	.171	.171	.170	.172	.173	.172	.174	.177	.181
Salmon.....(No. 1 can)	.271	.271	.274	.275	.277	.272	.274	.277	.293	.298	.301	.305
Fish.....(lb.)	.231	.234	.242	.257	.261	.257	.252	.244	.241	.249	.249	.255
Hens.....(lb.)	.284	.279	.283	.298	.323	.342	.350	.341	.340	.343	.349	.351
Tea.....(lb.)	.617	.618	.629	.627	.631	.621	.625	.630	.622	.625	.630	.636
Coffee.....(lb.)	.318	.317	.319	.320	.319	.306	.305	.305	.288	.284	.284	.284
Aggregates.....	$3.074	$3.105	$3.173	$3.298	$3.284	$3.037	$7.985	$3.013	$3.194	$3.436	$3.561	$3.787
Percentage of increase (+) or decrease (−) compared with the previous month.....		+0.4	+0.8	+1.5	−0.2	−3.0	−0.6	+0.3	+2.3	+2.9	+1.5	+2.6

* The monthly averages are made up of the averages of four or five weekly averages. The deciding factor as to what month a certain week's price belongs in, being the month which has the majority of days.

TABLE V.

STATEMENT SHOWING AVERAGE OF PRICES WEEK BY WEEK DURING THE ANNUAL PERIOD FROM THE WEEK ENDING OCTOBER 6, 1917, TO SEPTEMBER 28, 1918, ON 28 STAPLE FOOD ARTICLES IN THE UNITED STATES AND ON 22 IN CANADA.

Average price for	Wheat flour 1/16 bbl. bag		Wheat bread lb.		Cornmeal, bulk lb.		Oatmeal, bulk lb.		Rice lb.	
	United States	Canada	United States	Canada	United States	Canada	United States	Canada	United States	Canada
The year	$.829	$.822	$.102	$.076	$.067	*	$.087	$.075	$.120	$.106
Week ending 1917										
Oct. 6	.869	.834	.109	.072	.068	....	.089	.065	.109	.092
Oct. 13	.839	.824	.106	.073	.069	....	.090	.065	.109	.092
Oct. 20	.839	.824	.109	.073	.068	....	.089	.065	.110	.092
Oct. 27	.849	.824	.108	.074	.068	....	.088	.065	.111	.092
Nov. 3	.844	.824	.109	.073	.068	....	.088	.065	.110	.093
Nov. 10	.834	.819	.108	.075	.068	....	.088	.067	.110	.095
Nov. 17	.834	.814	.107	.074	.067	....	.089	.066	.112	.094
Nov. 24	.834	.819	.108	.075	.069	....	.088	.066	.111	.095
Dec. 1	.834	.819	.105	.075	.068	....	.088	.067	.112	.095
Dec. 8	.824	.819	.105	.075	.068	....	.087	.067	.112	.095
Dec. 15	.824	.814	.104	.075	.068	....	.087	.067	.113	.096
Dec. 22	.824	.819	.102	.075	.068	....	.087	.069	.112	.097
Dec. 29	.819	.819	.103	.072	.068	....	.087	.069	.112	.096
1918										
Jan. 5	.824	.819	.102	.075	.068	....	.088	.069	.114	.097
Jan. 12	.819	.819	.103	.075	.068	....	.088	.070	.114	.098
Jan. 19	.819	.819	.103	.075	.069	....	.088	.070	.114	.099
Jan. 26	.819	.819	.103	.076	.068	....	.088	.071	.114	.100
Feb. 2	.824	.819	.102	.076	.068	....	.087	.073	.115	.100
Feb. 9	.814	.814	.102	.075	.067	....	.087	.074	.115	.100
Feb. 16	.814	.814	.102	.075	.068	....	.087	.074	.115	.101
Feb. 23	.824	.814	.103	.075	.068	....	.088	.075	.117	.100
Mar. 2	.819	.814	.102	.075	.069	....	.087	.076	.116	.102
Mar. 9	.824	.814	.102	.076	.069	....	.088	.076	.117	.103
Mar. 16	.829	.839	.102	.076	.069	....	.088	.077	.118	.103
Mar. 23	.824	.844	.103	.076	.069	....	.088	.078	.118	.103
Mar. 30	.824	.849	.101	.077	.069	....	.089	.078	.118	.105
Apr. 6	.819	.849	.102	.078	.069	....	.090	.079	.118	.105
Apr. 13	.824	.844	.100	.078	.071	....	.093	.079	.119	.106
Apr. 20	.824	.844	.099	.078	.069	....	.090	.080	.120	.107
Apr. 27	.824	.844	.099	.076	.069	....	.091	.075	.119	.110
May 4	.824	.844	.099	.078	.069	....	.091	.080	.120	.110
May 11	.824	.844	.103	.078	.069	....	.092	.079	.121	.110
May 18	.824	.844	.099	.078	.069	....	.092	.080	.121	.111
May 25	.824	.844	.100	.078	.068	....	.092	.081	.121	.111
June 1	.824	.839	.100	.078	.068	....	.092	.080	.122	.112
June 8	.828	.810	.103	.078	.067	....	.086	.080	.123	.112
June 15	.820	.813	.099	.078	.066	....	.087	.081	.123	.114
June 22	.831	.810	.099	.078	.065	....	.085	.081	.125	.115
June 29	.828	.808	.099	.078	.066	....	.087	.080	.125	.115
July 6	.827	.808	.099	.077	.067	....	.085	.080	.126	.117
July 13	.828	.805	.099	.079	.065	....	.084	.080	.127	.116
July 20	.831	.809	.100	.078	.066	....	.085	.080	.128	.117
July 27	.833	.814	.099	.077	.065	....	.084	.080	.129	.116
Aug. 3	.836	.812	.100	.077	.067	....	.085	.081	.129	.118
Aug. 10	.836	.809	.099	.078	.066	....	.085	.081	.131	.119
Aug. 17	.837	.809	.099	.078	.067	....	.085	.080	.132	.118
Aug. 24	.839	.808	.099	.078	.066	....	.084	.081	.133	.120
Aug. 31	.837	.807	.099	.078	.066	....	.085	.081	.134	.119
Sept. 7	.840	.805	.098	.079	.066	....	.084	.081	.134	.120
Sept. 14	.836	.814	.099	.078	.066	....	.086	.081	.135	.121
Sept. 21	.834	.813	.099	.079	.066	....	.084	.081	.136	.122
Sept. 28	.837	.815	.099	.079	.066	....	.084	.080	.136	.121

* Indicates no quotations from Canada.

* The monthly averages are made up of the averages of four or five weekly averages. The deciding factor as to what month a certain week's price belongs in, being the month which has the majority of days.

TABLE V—(*Continued.*)

STATEMENT SHOWING AVERAGE OF PRICES WEEK BY WEEK DURING THE ANNUAL PERIOD FROM THE WEEK ENDING OCTOBER 6, 1917, TO SEPTEMBER 28, 1918, ON 28 STAPLE FOOD ARTICLES IN THE UNITED STATES AND ON 22 IN CANADA.

Average price for	Round steak lb.		Bacon lb.		Ham lb.		Pork chops lb.		Lard lb.	
	United States	Canada	United States	Canada	United States	Canada	United States	Canada	United States	Canada
The year	$.329	$.318	$.498	$.504	$.437	*	$.363	$.373	$.329	$.347
Week Ending 1917										
Oct. 6	.291	.286	.462	.451	.397	....	.368	.335	.308	.312
Oct. 13	.295	.286	.468	.455	.402	....	.375	.339	.311	.317
Oct. 20	.294	.286	.475	.461	.405	....	.371	.342	.313	.319
Oct. 27	.292	.286	.478	.465	.412	....	.368	.345	.314	.319
Nov. 3	.292	.286	.478	.467	.405	....	.362	.343	.315	.321
Nov. 10	.289	.283	.479	.469	.404	....	.353	.346	.318	.329
Nov. 17	.290	.284	.477	.472	.405	....	.352	.348	.324	.323
Nov. 24	.290	.285	.483	.469	.407	....	.352	.346	.327	.324
Dec. 1	.288	.283	.481	.472	.408	....	.348	.346	.331	.329
Dec. 8	.288	.285	.483	.472	.409	....	.347	.349	.332	.328
Dec. 15	.289	.284	.482	.473	.411	....	.346	.345	.332	.329
Dec. 22	.290	.285	.484	.473	.410	....	.346	.345	.333	.329
Dec. 29	.289	.286	.489	.475	.409	....	.346	.344	.332	.329
1918										
Jan. 5	.290	.286	.489	.475	.413	....	.350	.346	.334	.333
Jan. 12	.292	.290	.488	.475	.412	....	.346	.345	.332	.335
Jan. 19	.294	.291	.488	.477	.415	....	.346	.350	.332	.333
Jan. 26	.295	.291	.491	.479	.417	....	.345	.353	.331	.335
Feb. 2	.298	.292	.493	.482	.419	....	.347	.356	.333	.335
Feb. 9	.298	.294	.492	.483	.418	....	.345	.353	.333	.338
Feb. 16	.298	.297	.491	.485	.417	....	.343	.358	.333	.337
Feb. 23	.300	.298	.488	.489	.419	....	.344	.361	.332	.337
Mar. 1	.301	.299	.491	.491	.423	....	.342	.361	.333	.339
Mar. 9	.301	.300	.482	.494	.419	....	.339	.360	.331	.339
Mar. 16	.303	.301	.482	.496	.415	....	.341	.364	.332	.341
Mar. 23	.305	.298	.486	.497	.419	....	.343	.364	.332	.343
Mar. 30	.307	.303	.484	.499	.421	....	.343	.365	.332	.347
Apr. 6	.311	.304	.488	.499	.422	....	.344	.369	.333	.348
Apr. 13	.317	.307	.490	.511	.427	....	.347	.376	.333	.348
Apr. 20	.329	.308	.494	.510	.431	....	.350	.379	.333	.347
Apr. 27	.335	.311	.494	.514	.432	....	.353	.379	.334	.348
May 4	.343	.317	.496	.518	.433	....	.355	.382	.332	.352
May 11	.345	.331	.494	.524	.434	....	.356	.391	.332	.356
May 18	.351	.336	.497	.529	.437	....	.359	.394	.333	.359
May 25	.354	.344	.496	.534	.437	....	.359	.396	.331	.366
June 1	.357	.349	.502	.534	.445	....	.361	.399	.331	.362
June 8	.365	.351	.508	.535	.459	....	.365	.399	.330	.368
June 15	.377	.352	.507	.535	.455	....	.369	.399	.329	.367
June 22	.379	.362	.511	.538	.463	....	.368	.402	.327	.370
June 29	.379	.367	.511	.537	.463	....	.371	.402	.330	.368
July 6	.377	.365	.512	.537	.465	....	.370	.399	.327	.368
July 13	.378	.367	.511	.536	.467	....	.372	.401	.328	.368
July 20	.378	.366	.514	.538	.468	....	.375	.399	.329	.368
July 27	.374	.364	.514	.537	.471	....	.377	.398	.327	.368
Aug. 3	.375	.361	.519	.541	.472	....	.381	.399	.329	.371
Aug. 10	.377	.360	.522	.541	.477	....	.386	.401	.328	.369
Aug. 17	.374	.359	.524	.542	.481	....	.391	.400	.330	.367
Aug. 24	.377	.362	.527	.542	.485	....	.399	.400	.332	.369
Aug. 31	.377	.358	.533	.544	.488	....	.401	.401	.333	.370
Sept. 7	.380	.356	.534	.541	.491	....	.409	.401	.333	.369
Sept. 14	.380	.351	.541	.539	.500	....	.418	.399	.335	.367
Sept. 21	.382	.352	.548	.544	.507	....	.426	.402	.336	.369
Sept. 28	.381	.347	.554	.535	.509	....	.430	.398	.336	.369

* Indicates no quotations from Canada.

TABLE V—(*Continued*).

STATEMENT SHOWING AVERAGE OF PRICES WEEK BY WEEK DURING THE ANNUAL PERIOD FROM THE WEEK ENDING OCTOBER 6, 1917, TO SEPTEMBER 28, 1918, ON 28 STAPLE FOOD ARTICLES IN THE UNITED STATES AND ON 22 IN CANADA.

Average price for	Milk qt.		Butter lb.		Oleomargarine lb.		Cheese lb.		Eggs doz.	
	United States	Canada	United States	Canada	United States	Canada	United States	Canada	United States	Canada
The year	$.126	$.098	$.526	$.522	$.352	*	$.350	$.305	$.476	$.542
Week ending 1917										
Oct. 6	.116	.087	.511	.495	.324	....	.348	.302	.482	.514
Oct. 13	.118	.089	.510	.499	.347	....	.349	.303	.488	.534
Oct. 20	.117	.090	.511	.505	.349	....	.351	.303	.490	.547
Oct. 27	.118	.091	.510	.508	.346	....	.351	.303	.498	.563
Nov. 3	.121	.091	.510	.511	.350	....	.352	.303	.508	.562
Nov. 10	.123	.095	.510	.513	.349	....	.351	.301	.512	.606
Nov. 17	.121	.097	.509	.512	.353	....	.350	.301	.514	.584
Nov. 24	.123	.097	.513	.513	.351	....	.351	.301	.537	.596
Dec. 1	.123	.097	.513	.513	.351	....	.352	.301	.543	.606
Dec. 8	.125	.097	.515	.513	.350	....	.352	.301	.551	.613
Dec 15	.127	.098	.525	.513	.352	....	.351	.303	.557	.608
Dec. 22	.126	.098	.531	.511	.354	....	.352	.303	.563	.616
Dec. 29	.125	.098	.537	.510	.358	....	.352	.331	.574	.609
1918										
Jan. 5	.127	.098	.539	.513	.354	....	.351	.301	.590	.623
Jan. 12	.127	.098	.543	.513	.355	....	.352	.303	.593	.625
Jan. 19	.126	.099	.547	.512	.355	....	.352	.304	.610	.632
Jan. 26	.126	.099	.553	.513	.358	....	.352	.304	.623	.632
Feb. 2	.127	.099	.555	.516	.357	....	.354	.305	.631	.640
Feb. 9	.127	.099	.556	.522	.357	....	.353	.304	.618	.643
Feb. 16	.126	.099	.557	.528	.359	....	.355	.305	.573	.640
Feb. 23	.128	.099	.556	.534	.357	....	.357	.304	.545	.642
Mar. 2	.127	.098	.557	.540	.359	....	.358	.305	.480	.647
Mar. 9	.128	.099	.546	.537	.352	....	.353	.306	.410	.621
Mar. 16	.128	.099	.539	.543	.352	....	.354	.303	.394	.587
Mar. 23	.128	.099	.528	.545	.352	....	.354	.303	.394	.543
Mar. 30	.128	.099	.517	.549	.350	....	.353	.304	.390	.520
Apr. 6	.127	.100	.509	.549	.352	....	.352	.304	.385	.490
Apr. 13	.127	.100	.504	.547	.351	....	.350	.304	.383	.481
Apr. 20	.127	.099	.496	.548	.350	....	.349	.304	.382	.461
Apr. 27	.128	.100	.503	.548	.355	....	.346	.306	.382	.448
May 4	.128	.100	.501	.545	.351	....	.348	.305	.384	.442
May 11	.126	.100	.501	.541	.352	....	.346	.304	.384	.439
May 18	.127	.100	.501	.533	.351	....	.346	.303	.386	.435
May 25	.125	.099	.498	.532	.351	....	.344	.303	.383	.442
June 1	.127	.100	.499	.526	.351	....	.344	.303	.383	.445
June 8	.126	.099	.501	.522	.351	....	.342	.304	.385	.446
June 15	.125	.099	.498	.513	.352	....	.341	.304	.386	.447
June 22	.126	.099	.503	.514	.349	....	.339	.305	.392	.444
June 29	.126	.099	.506	.508	.349	....	.341	.306	.399	.457
July 6	.126	.098	.509	.510	.351	....	.340	.307	.408	.463
July 13	.127	.099	.512	.513	.351	....	.340	.306	.422	.477
July 20	.127	.098	.513	.512	.352	....	.342	.305	.433	.492
July 27	.127	.098	.518	.514	.351	....	.343	.305	.441	.491
Aug. 3	.129	.098	.522	.519	.353	....	.344	.307	.447	.513
Aug. 10	.129	.099	.524	.522	.353	....	.346	.309	.454	.527
Aug. 17	.129	.099	.528	.519	.353	....	.349	.308	.462	.525
Aug. 24	.131	.100	.533	.527	.355	....	.349	.309	.473	.537
Aug. 31	.129	.100	.539	.524	.356	....	.353	.308	.479	.537
Sept. 7	.131	.100	.546	.525	.355	....	.354	.309	.492	.544
Sept. 14	.132	.101	.562	.523	.360	....	.358	.307	.501	.542
Sept. 21	.133	.103	.591	.529	.363	....	.361	.310	.517	.557
Sept. 28	.133	.101	.619	.525	.367	....	.368	.307	.529	.554

*Indicates no quotations from Canada.

TABLE V—(*Continued*).

STATEMENT SHOWING AVERAGE OF PRICES WEEK BY WEEK DURING THE ANNUAL PERIOD FROM THE WEEK ENDING OCTOBER 6, 1917, TO SEPTEMBER 28, 1918, ON 28 STAPLE FOOD ARTICLES IN THE UNITED STATES AND ON 22 IN CANADA.

Average price for	Sugar lb.		Potatoes pk.		Beans lb.		Onions lb.		Prunes lb.	
	United States	Canada	United States	Canada	United States	Canada	United States	Canada	United States	Canada
The year	$.096	$.108	$.453	*	$.179	$.168	$.052	*	$.169	$.173
Week ending 1917										
Oct. 6	.098	.106	.419	....	.187	.165	.049	....	.171	.159
Oct. 13	.098	.106	.420	....	.187	.166	.051	....	.172	.160
Oct. 20	.098	.106	.433	....	.188	.167	.051	....	.176	.162
Oct. 27	.099	.106	.447	....	.189	.167	.051	....	.173	.162
Nov. 3	.099	.107	.449	....	.189	.167	.052	....	.174	.164
Nov. 10	.099	.107	.448	....	.186	.164	.051	....	.172	.164
Nov. 17	.099	.107	.451	....	.185	.162	.051	....	.171	.165
Nov. 24	.099	.108	.451	....	.186	.163	.051	....	.173	.164
Dec. 1	.099	.107	.445	....	.185	.164	.052	....	.172	.164
Dec. 8	.098	.107	.442	....	.184	.164	.052	....	.170	.164
Dec. 15	.099	.108	.440	....	.186	.163	.052	....	.172	.160
Dec. 22	.098	.108	.439	....	.182	.164	.052	....	.168	.171
Dec. 29	.098	.108	.441	....	.184	.165	.052	....	.169	.172
1918										
Jan. 5	.098	.108	.442	....	.185	.165	.052	....	.170	.170
Jan. 12	.098	.107	.442	....	.184	.164	.053	....	.170	.169
Jan. 19	.097	.107	.444	....	.183	.167	.053	....	.171	.173
Jan. 26	.097	.106	.444	....	.183	.167	.053	....	.170	.173
Feb. 2	.097	.106	.450	....	.183	.169	.054	....	.169	.173
Feb. 9	.097	.105	.445	....	.181	.168	.053	....	.168	.171
Feb. 16	.096	.105	.443	....	.181	.169	.053	....	.170	.172
Feb. 23	.096	.106	.422	....	.180	.164	.053	....	.170	.172
Mar. 2	.095	.105	.434	....	.179	.170	.052	....	.169	.172
Mar. 9	.095	.105	.421	....	.182	.169	.051	....	.168	.172
Mar. 16	.095	.105	.399	....	.182	.169	.050	....	.169	.172
Mar. 23	.094	.104	.382	....	.182	.169	.048	....	.169	.171
Mar. 30	.094	.104	.367	....	.182	.169	.046	....	.170	.173
Apr. 6	.094	.105	.352	....	.181	.170	.045	....	.169	.173
Apr. 13	.094	.106	.334	....	.180	.169	.044	....	.169	.175
Apr. 20	.093	.106	.330	....	.180	.169	.044	....	.169	.175
Apr. 27	.093	.106	.329	....	.179	.170	.045	....	.170	.176
May 4	.093	.107	.331	....	.179	.169	.046	....	.169	.176
May 11	.093	.108	.337	....	.179	.169	.049	....	.170	.177
May 18	.093	.108	.323	....	.177	.171	.049	....	.168	.175
May 25	.093	.108	.317	....	.177	.171	.051	....	.169	.177
June 1	.093	.108	.313	....	.177	.177	.053	....	.169	.176
June 8	.092	.108	.444	....	.175	.170	.054	....	.163	.177
June 15	.093	.109	.449	....	.178	.169	.056	....	.167	.176
June 22	.093	.109	.454	....	.175	.172	.055	....	.163	.176
June 29	.093	.109	.478	....	.175	.171	.056	....	.164	.177
July 6	.093	.108	.619	....	.174	.170	.056	....	.164	.179
July 13	.094	.109	.607	....	.174	.171	.057	....	.163	.179
July 20	.094	.109	.602	....	.173	.171	.057	....	.165	.178
July 27	.094	.109	.579	....	.173	.173	.057	....	.165	.182
Aug. 3	.095	.109	.568	....	.172	.170	.057	....	.166	.179
Aug. 10	.095	.110	.564	....	.173	.169	.057	....	.167	.181
Aug. 17	.095	.109	.569	....	.172	.170	.057	....	.167	.181
Aug. 24	.095	.111	.568	....	.173	.171	.057	....	.168	.181
Aug. 31	.095	.112	.569	....	.173	.170	.057	....	.170	.182
Sept. 7	.096	.114	.578	....	.171	.169	.056	....	.170	.184
Sept. 14	.097	.115	.574	....	.172	.169	.055	....	.171	.184
Sept. 21	.100	.118	.574	....	.171	.168	.055	....	.172	.183
Sept. 28	.102	.119	.572	....	.170	.168	.053	....	.173	.183

* Indicates no quotations from Canada, or, if quoted, are quoted on unit bases not readily reduced to the United States unit.

TABLE V—(*Continued*).

STATEMENT SHOWING AVERAGE OF PRICES WEEK BY WEEK DURING THE ANNUAL PERIOD FROM THE WEEK ENDING OCTOBER 6, 1917, TO SEPTEMBER 28, 1918, ON 28 STAPLE FOOD ARTICLES IN THE UNITED STATES AND ON 22 IN CANADA.

Average price for	Canned tomatoes (No. 2 can)		Canned peas (No. 2 can)		Canned corn (No. 2 can)		Canned salmon, red (No. 1 can)	
	United States	Canada	United States	Canada	United States	Canada	United States	Canada
The year	$.166	$.163	$.178	$.196	$.173	$.231	$.282	$.302
Week ending 1917								
Oct. 6	.168	.141	.175	.160	.175	.189	.272	.264
Oct. 13	.169	.141	.181	.161	.178	.190	.271	.261
Oct. 20	.168	.143	.179	.170	.178	.196	.270	.269
Oct. 27	.168	.147	.177	.176	.178	.203	.271	.272
Nov. 3	.167	.149	.175	.179	.174	.210	.271	.275
Nov. 10	.167	.154	.177	.188	.175	.225	.271	.281
Nov. 17	.165	.152	.176	.186	.173	.216	.272	.278
Nov. 24	.165	.153	.175	.187	.173	.219	.272	.290
Dec. 1	.163	.154	.177	.188	.171	.225	.271	.281
Dec. 8	.161	.154	.171	.189	.173	.223	.270	.287
Dec. 15	.162	.155	.175	.192	.170	.226	.275	.290
Dec. 22	.159	.155	.177	.193	.170	.225	.275	.289
Dec. 29	.161	.158	.176	.193	.170	.227	.276	.289
1918								
Jan. 5	.161	.164	.177	.193	.172	.229	.275	.288
Jan. 12	.161	.165	.176	.193	.170	.230	.274	.293
Jan. 19	.163	.167	.176	.194	.170	.231	.275	.295
Jan. 26	.163	.165	.179	.194	.172	.232	.276	.295
Feb. 2	.164	.166	.177	.195	.171	.232	.273	.297
Feb. 9	.163	.166	.176	.197	.170	.231	.274	.293
Feb. 16	.162	.165	.176	.197	.171	.232	.275	.293
Feb. 23	.163	.166	.178	.198	.172	.232	.278	.298
Mar. 2	.165	.165	.180	.201	.172	.233	.280	.303
Mar. 9	.164	.166	.173	.199	.168	.234	.272	.303
Mar. 16	.165	.165	.175	.198	.170	.233	.272	.307
Mar. 23	.165	.167	.177	.199	.171	.234	.273	.305
Mar. 30	.165	.167	.176	.198	.171	.234	.272	.306
Apr. 6	.166	.167	.177	.198	.171	.234	.274	.304
Apr. 13	.166	.167	.178	.200	.171	.236	.274	.306
Apr. 20	.166	.167	.178	.199	.173	.236	.274	.306
Apr. 27	.166	.166	.179	.199	.172	.234	.275	.308
May 4	.166	.168	.177	.201	.172	.236	.275	.308
May 11	.168	.167	.179	.200	.173	.236	.277	.311
May 18	.166	.168	.178	.203	.173	.238	.276	.310
May 25	.166	.168	.177	.202	.173	.239	.276	.315
June 1	.168	.168	.179	.203	.174	.240	.279	.309
June 8	.164	.168	.177	.204	.171	.239	.291	.313
June 15	.162	.170	.176	.204	.172	.239	.293	.314
June 22	.163	.169	.176	.204	.172	.240	.294	.313
June 29	.165	.169	.177	.203	.172	.239	.295	.314
July 6	.165	.169	.177	.204	.173	.240	.296	.315
July 13	.166	.170	.178	.204	.173	.241	.296	.316
July 20	.166	.171	.178	.204	.173	.242	.298	.317
July 27	.167	.171	.177	.205	.174	.242	.298	.315
Aug. 3	.168	.171	.179	.203	.175	.243	.300	.319
Aug. 10	.168	.171	.178	.203	.176	.243	.300	.319
Aug. 17	.168	.171	.181	.203	.177	.245	.300	.323
Aug. 24	.169	.169	.181	.202	.178	.244	.301	.325
Aug. 31	.170	.169	.183	.202	.179	.243	.303	.323
Sept. 7	.171	.169	.183	.202	.179	.243	.303	.324
Sept. 14	.172	.167	.184	.201	.182	.243	.304	.324
Sept. 21	.172	.169	.185	.201	.182	.244	.305	.327
Sept. 28	.173	.170	.187	.202	.183	.245	.308	.330

TABLE V—(*Concluded*).

STATEMENT SHOWING AVERAGE OF PRICES WEEK BY WEEK DURING THE ANNUAL PERIOD FROM THE WEEK ENDING OCTOBER 6, 1917, TO SEPTEMBER 28, 1918, ON 28 STAPLE FOOD ARTICLES IN THE UNITED STATES AND ON 22 IN CANADA.

Average price for	Fish lb.		Hens lb.		Tea lb.		Coffee lb.	
	United States	Canada	United States	Canada	United States	Canada	United States	Canada
The year	$.247	$.180	$.323	*	$.626	$.540	$.304	$.422
Week ending 1917								
Oct. 6	.227	.180	.279	....	.616	.493	.318	.405
Oct. 13	.224	.180	.289	....	.621	.493	.321	.405
Oct. 20	.231	.186	.285	....	.617	.494	.320	.403
Oct. 27	.242	.180	.285	....	.612	.493	.314	.403
Nov. 3	.229	.183	.281	....	.619	.496	.317	.402
Nov. 10	.236	.178	.278	....	.617	.493	.316	.399
Nov. 17	.235	.181	.279	....	.614	.497	.319	.401
Nov. 24	.230	.178	.278	....	.626	.497	.320	.402
Dec. 1	.235	.178	.279	....	.615	.493	.315	.399
Dec. 8	.237	.180	.279	....	.628	.496	.317	.401
Dec. 15	.236	.182	.282	....	.625	.500	.318	.404
Dec. 22	.247	.185	.284	....	.627	.502	.321	.403
Dec. 29	.249	.179	.287	....	.634	.502	.321	.407
1918								
Jan. 5	.251	.178	.291	....	.631	.501	.320	.405
Jan. 12	.249	.180	.292	....	.626	.504	.318	.405
Jan. 19	.256	.185	.296	....	.626	.501	.320	.404
Jan. 26	.265	.183	.302	....	.629	.503	.321	.405
Feb. 2	.263	.183	.309	....	.625	.505	.319	.405
Feb. 9	.259	.180	.315	....	.627	.508	.320	.406
Feb. 16	.264	.176	.321	....	.633	.511	.319	.402
Feb. 23	.258	.178	.328	....	.631	.509	.318	.407
Mar. 2	.265	.172	.326	....	.633	.510	.320	.407
Mar. 9	.257	.180	.339	....	.619	.511	.307	.407
Mar. 16	.256	.183	.340	....	.624	.511	.305	.408
Mar. 23	.257	.179	.337	....	.624	.512	.306	.407
Mar. 30	.258	.180	.351	....	.615	.511	.305	.409
Apr. 6	.254	.178	.354	....	.618	.511	.305	.409
Apr. 13	.251	.182	.356	....	.628	.511	.306	.412
Apr. 20	.252	.185	.349	....	.629	.511	.306	.409
Apr. 27	.250	.184	.341	....	.627	.512	.305	.410
May 4	.243	.186	.345	....	.631	.516	.309	.409
May 11	.247	.187	.342	....	.628	.556	.305	.422
May 18	.245	.188	.339	....	.630	.573	.304	.429
May 25	.243	.181	.340	....	.631	.583	.305	.435
June 1	.244	.182	.340	....	.632	.586	.302	.442
June 8	.242	.180	.339	....	.628	.585	.292	.439
June 15	.241	.183	.340	....	.617	.581	.287	.444
June 22	.240	.181	.341	....	.625	.580	.287	.444
June 29	.243	.179	.341	....	.619	.593	.286	.442
July 6	.244	.183	.342	....	.622	.599	.285	.445
July 13	.245	.178	.342	....	.626	.597	.284	.447
July 20	.248	.179	.343	....	.629	.600	.285	.446
July 27	.258	.183	.343	....	.622	.597	.283	.457
Aug. 3	.248	.180	.346	....	.625	.594	.285	.459
Aug. 10	.248	.179	.349	....	.626	.605	.284	.449
Aug. 17	.247	.183	.345	....	.630	.608	.285	.450
Aug. 24	.251	.175	.351	....	.634	.609	.284	.456
Aug. 31	.249	.177	.349	....	.630	.605	.283	.451
Sept. 7	.253	.177	.351	....	.630	.609	.284	.451
Sept. 14	.255	.172	.352	....	.643	.606	.285	.450
Sept. 21	255	.172	.354	....	.632	.609	.283	.456
Sept. 28	.256	.174	.347	....	.640	.609	.284	.451

*Indicates no quotations from Canada.

TABLE VI (A).

AVERAGE AND RELATIVE WEEKLY RETAIL PRICES ON THE COMMODITIES NAMED, FROM THE WEEK ENDING OCTOBER 6, 1917, TO SEPTEMBER 28, 1918 (THE AVERAGE PRICE FOR OCTOBER 1917, TAKEN AS 100).

	Wheat flour 1/16 bbl. bag		Cornmeal lb.		Rice lb.		Potatoes lb.	
	Average price	Relative price	Average price	Relative price	Average price	Relative price	Average price	Relative price
Average	$.848	100.0	$.068	100.0	$.110	100.0	$.434	100.0
Week ending 1917								
Oct. 6...	.869	102.5	.068	100.0	.109	99.1	.419	96.5
Oct. 13...	.839	98.9	.069	101.5	.109	99.1	.420	96.8
Oct. 20...	.839	98.9	.068	100.0	.110	100.0	.433	99.8
Oct. 27...	.849	100.1	.068	100.0	.111	100.9	.447	103.0
Nov. 3...	.844	99.5	.068	100.0	.110	100.0	.449	103.5
Nov. 10...	.834	98.3	.068	100.0	.110	100.0	.448	103.2
Nov. 17...	.834	98.3	.067	98.5	.112	101.8	.451	103.9
Nov. 24...	.834	98.3	.069	101.5	.111	100.9	.451	103.9
Dec.. 1...	.834	98.3	.068	100.0	.112	101.8	.445	102.5
Dec. 8...	.824	97.2	.068	100.0	.112	101.8	.442	101.8
Dec. 15...	.824	97.2	.068	100.0	.113	102.7	.440	101.4
Dec. 22...	.824	97.2	.068	100.0	.112	101.8	.439	101.1
Dec. 29...	.819	96.6	.068	100.0	.112	101.8	.441	101.6
1918								
Jan. 5...	.824	97.2	.068	100.0	.114	103.6	.442	101.8
Jan. 12...	.819	96.6	.068	100.0	.114	103.6	.442	101.8
Jan. 19...	.819	96.6	.069	101.5	.114	103.6	.444	102.3
Jan. 26...	.819	96.6	.068	100.0	.114	103.6	.444	102.3
Feb. 2...	.824	97.2	.068	100.0	.115	104.5	.450	103.7
Feb. 9...	.814	96.0	.067	98.5	.115	104.5	.445	102.5
Feb. 16...	.814	96.0	.068	100.0	.115	104.5	.443	102.1
Feb. 23...	.824	97.2	.068	100.0	.117	106.4	.422	97.2
Mar. 2...	.819	96.6	.069	101.5	.116	105.5	.434	100.0
Mar. 9...	.824	97.2	.069	101.5	.117	106.4	.421	97.0
Mar. 16...	.829	97.7	.069	101.5	.118	107.3	.399	91.9
Mar. 23...	.824	97.2	.069	101.5	.118	107.3	.382	88.0
Mar. 30...	.824	97.2	.069	101.5	.118	107.3	.367	84.6
Apr. 6...	.819	96.6	.069	101.5	.118	107.3	.352	81.1
Apr. 13...	.824	97.2	.071	104.4	.119	108.2	.334	76.9
Apr. 20...	.824	97.2	.069	101.5	.120	109.1	.330	76.0
Apr. 27...	.824	97.2	.069	101.5	.119	108.2	.329	75.8
May 4...	.824	97.2	.069	101.5	.120	109.1	.331	76.3
May 11...	.824	97.2	.069	101.5	.121	110.0	.327	75.3
May 18...	.824	97.2	.069	101.5	.121	110.0	.323	74.4
May 25...	.824	97.2	.068	100.0	.121	110.0	.317	73.0
June 1...	.824	97.2	.068	100.0	.122	110.9	.313	72.1
June 8...	.828	97.6	.067	98.5	.123	111.8	.331	76.3
June 15...	.820	96.7	.066	97.1	.123	111.8	.325	74.9
June 22...	.831	98.0	.065	95.6	.125	113.6	.334	76.9
June 29...	.828	97.6	.066	97.1	.125	113.6	.346	79.7
July 6...	.827	97.5	.067	98.5	.126	114.5	.619	142.6
July 13...	.828	97.6	.065	95.6	.127	115.5	.607	139.9
July 20...	.831	98.0	.066	97.1	.128	116.4	.602	138.7
July 27...	.833	98.2	.065	95.6	.129	117.3	.579	133.4
Aug. 3...	.836	98.6	.067	98.5	.129	117.3	.568	130.9
Aug. 10...	.836	98.6	.066	97.1	.131	119.1	.564	129.9
Aug. 17...	.837	98.7	.067	98.5	.132	120.0	.569	131.1
Aug. 24...	.839	98.9	.066	97.1	.133	120.9	.568	130.9
Aug. 31...	.837	98.7	.066	97.1	.134	121.8	.569	131.1
Sept. 7...	.840	99.1	.066	97.1	.134	121.8	.578	133.2
Sept. 14...	.836	98.6	.066	97.1	.135	122.7	.574	132.3
Sept. 21...	.834	98.3	.066	97.1	.136	123.6	.574	132.3
Sept. 28...	.837	98.7	.066	97.1	.136	123.6	.572	131.8

TABLE VI (B).

AVERAGE AND RELATIVE WEEKLY RETAIL PRICES ON COMMODITIES NAMED, FROM THE WEEK ENDING OCTOBER 6, 1917, TO SEPTEMBER 28, 1918. (THE AVERAGE PRICE FOR OCTOBER 1917 TAKEN AS 100.)

	Round steak lb.		Bacon lb.		Pork chops lb.		Lard lb.	
	Average price	Relative price	Average price	Relative price	Average price	Relative price	Average price	Relative price
Average	$.293	100.0	$.472	100.0	$.369	100.0	$.312	100.0
Week ending 1917								
Oct. 6	.291	99.3	.462	97.9	.368	99.7	.308	98.7
Oct. 13	.295	100.7	.468	99.1	.375	101.6	.311	99.7
Oct. 20	.294	100.3	.475	100.6	.371	100.5	.313	100.3
Oct. 27	.292	99.7	.478	101.3	.368	99.7	.314	100.6
Nov. 3	.292	99.7	.478	101.3	.362	98.1	.315	101.0
Nov. 10	.289	98.6	.479	101.5	.353	95.7	.318	101.9
Nov. 17	.290	99.0	.477	101.1	.352	95.4	.324	103.8
Nov. 24	.290	99.0	.483	102.3	.352	95.4	.327	104.8
Dec. 1	.288	98.3	.481	101.9	.348	94.3	.331	106.1
Dec. 8	.288	98.3	.483	102.3	.347	94.0	.332	106.4
Dec. 15	.289	98.6	.482	102.1	.346	93.8	.332	106.4
Dec. 22	.290	99.0	.484	102.5	.346	93.8	.333	106.7
Dec. 29	.289	98.6	.489	103.6	.346	93.8	.332	106.4
1918								
Jan. 5	.290	99.0	.489	103.6	.350	94.9	.334	107.1
Jan. 12	.292	99.7	.488	103.4	.346	93.8	.332	106.4
Jan. 19	.294	100.3	.488	103.4	.346	93.8	.332	106.4
Jan. 26	.295	100.7	.491	104.0	.345	93.5	.331	106.1
Feb. 2	.298	101.7	.493	104.4	.347	94.0	.333	106.7
Feb. 9	.298	101.7	.492	104.2	.345	93.5	.333	106.7
Feb. 16	.298	101.7	.491	104.0	.343	92.9	.333	106.7
Feb. 23	.300	102.4	.488	103.4	.344	93.2	.332	106.4
Mar. 2	.301	102.7	.491	104.0	.342	92.7	.333	106.7
Mar. 9	.301	102.7	.482	102.1	.339	91.9	.331	106.1
Mar. 16	.303	103.4	.482	102.1	.341	92.4	.332	106.4
Mar. 23	.305	104.1	.486	103.0	.343	92.9	.332	106.4
Mar. 30	.307	104.8	.484	102.5	.343	92.9	.332	106.4
Apr. 6	.311	106.1	.488	103.4	.344	93.2	.333	106.7
Apr. 13	.317	108.2	.490	103.8	.347	94.0	.333	106.7
Apr. 20	.329	112.3	.494	104.7	.350	94.9	.333	106.7
Apr. 27	.335	114.3	.494	104.7	.353	95.7	.334	107.1
May 4	.343	117.1	.496	105.1	.355	96.2	.332	106.4
May 11	.345	117.7	.494	104.7	.356	96.5	.332	106.4
May 18	.351	119.8	.497	105.3	.359	97.3	.333	106.7
May 25	.354	120.8	.496	105.1	.359	97.3	.331	106.1
June 1	.357	121.8	.502	106.3	.361	97.8	.331	106.1
June 8	.365	124.6	.506	107.2	.365	98.9	.330	105.8
June 15	.377	128.7	.507	107.4	.369	100.0	.329	105.4
June 22	.379	129.3	.511	108.3	.368	99.7	.327	104.8
June 29	.379	129.3	.511	108.3	.371	100.5	.330	105.8
July 6	.377	128.7	.512	108.5	.370	100.3	.327	104.8
July 13	.378	129.0	.511	108.3	.372	100.8	.328	105.1
July 20	.378	129.0	.514	108.9	.375	101.6	.329	105.4
July 27	.374	127.6	.514	108.9	.367	99.5	.327	104.8
Aug. 3	.375	128.0	.519	109.9	.381	103.3	.329	105.4
Aug. 10	.377	128.7	.522	110.6	.386	104.6	.328	105.1
Aug. 17	.374	127.6	.524	111.0	.391	106.0	.330	105.8
Aug. 24	.377	128.7	.527	111.7	.399	108.1	.332	106.4
Aug. 31	.377	128.7	.533	112.9	.401	108.7	.333	106.7
Sept. 7	.380	129.7	.534	113.1	.409	110.8	.333	106.7
Sept. 14	.380	129.7	.541	114.6	.418	113.3	.335	107.4
Sept. 21	.382	130.4	.548	116.1	.426	115.4	.336	107.7
Sept. 28	.381	130.0	.554	117.4	.430	116.5	.336	107.7

TABLE VII.

STATEMENT SHOWING AVERAGE OF PRICES, WEEK BY WEEK, DURING THE QUARTERLY PERIOD FROM OCTOBER 5, 1918, TO DECEMBER 28, 1918, ON 28 STAPLE FOOD ARTICLES FOR THE UNITED STATES AND ON 22 FOR CANADA

Average price for	Wheat flour 1/16 bbl. bag		Wheat bread lb.		Corn-meal, bulk lb.	Oatmeal, bulk lb.		Rice lb.	
	United States	Canada	United States	Canada	United States	United States	Canada	United States	Canada
The quarter	$.826	$.823	$.098	$.079	$.064	$.082	$.082	$.138	$.124
Week ending									
Oct. 5	.834	.815	.099	.073	.066	.085	.081	.137	.122
Oct. 13	.834	.822	.099	.080	.066	.083	.081	.138	.123
Oct. 19	.833	.821	.099	.080	.066	.085	.082	.139	.121
Oct. 26	.832	.820	.099	.080	.066	.086	.081	.139	.124
Nov. 2	.831	.823	.099	.080	.066	.081	.083	.139	.124
Nov. 9	.828	.822	.098	.079	.065	.080	.082	.139	.124
Nov. 16	.824	.830	.098	.078	.064	.080	.082	.139	.123
Nov. 23	.821	.829	.098	.079	.064	.081	.082	.139	.125
Nov. 30	.822	.823	.098	.079	.063	.081	.081	.138	.125
Dec. 7	.822	.825	.099	.079	.063	.080	.082	.139	.125
Dec. 14	.822	*	.098	*	.063	.080	*	.138	*
Dec. 21	.818	*	.097	*	.063	.080	*	.138	*
Dec. 28	.813	*	.099	*	.063	.079	*	.138	*

Average price for	Steak, round lb.		Bacon lb.		Ham lb.	Pork chops lb.		Lard lb.	
	United States	Canada	United States	Canada	United States	United States	Canada	United States	Canada
The quarter	$.374	$.315	$.574	$.541	$.521	$.414	$.401	$.340	$.371
Week ending									
Oct. 5	.381	.349	.562	.544	.514	.435	.405	.340	.372
Oct. 12	.381	.347	.563	.539	.514	.432	.408	.340	.369
Oct. 19	.377	.347	.566	.539	.515	.427	.403	.340	.370
Oct. 26	.376	.345	.570	.541	.518	.421	.407	.341	.371
Nov. 2	.374	.343	.571	.539	.519	.415	.402	.341	.372
Nov. 9	.373	.360	.574	.543	.520	.413	.400	.339	.373
Nov. 16	.375	.342	.575	.539	.511	.414	.398	.341	.369
Nov. 23	.371	.339	.576	.539	.523	.411	.398	.340	.371
Nov. 30	.373	.338	.575	.544	.523	.410	.395	.342	.370
Dec. 7	.369	.338	.579	.542	.526	.406	.396	.341	.369
Dec. 14	.371	*	.582	*	.526	.404	*	.340	*
Dec. 21	.370	*	.581	*	.529	.401	*	.340	*
Dec. 28	.376	*	.587	*	.532	.399	*	.339	*

* Indicates no quotations from Canada.

TABLE VII—(*Continued*).

STATEMENT SHOWING AVERAGE OF PRICES, WEEK BY WEEK, DURING THE QUARTERLY PERIOD FROM OCTOBER 5, 1918, TO DECEMBER 28 1918, ON 28 STAPLE FOOD ARTICLES FOR THE UNITED STATES AND ON 22 FOR CANADA

Average price for	Milk qt.		Butter lb.		Oleomargarine lb.	Cheese lb.		Eggs, fresh doz.	
	United States	Canada	United States	Canada	United States	United States	Canada	United States	Canada
The quarter	$.143	$.109	$.663	$.565	$.381	$.402	$.319	$.639	$.642
Week ending									
Oct. 5....	.137	.105	.635	.540	.371	.375	.311	.543	.577
Oct. 12....	.139	.106	.635	.551	.374	.378	.313	.555	.596
Oct. 19....	.140	.106	.635	.556	.375	.384	.313	.564	.603
Oct. 26....	.140	.106	.637	.561	.377	.389	.315	.583	.617
Nov. 2....	.142	.108	.640	.564	.381	.395	.319	.605	.636
Nov. 9....	.143	.111	.645	.571	.382	.399	.321	.622	.656
Nov. 16....	.144	.112	.651	.574	.383	.402	.321	.641	.648
Nov. 23....	.145	.113	.664	.577	.383	.406	.323	.669	.687
Nov. 30....	.146	.113	.673	.577	.384	.411	.330	.691	.697
Dec. 7....	.146	.114	.688	.576	.385	.415	.325	.705	.701
Dec. 14....	.147	*	.701	*	.386	.422	*	.709	*
Dec. 21....	.146	*	.709	*	.386	.424	*	.720	*
Dec. 28....	.147	*	.707	*	.387	.428	*	.704	*

Average price for	Sugar lb.		Potatoes pk.		Beans, white lb.		Onions lb.	Prunes lb.	
	United States	Canada	United States	Canada	United States	Canada	United States	United States	Canada
The quarter	$.108	$.122	$.503	*	$.163	$.165	$.047	$.177	$.189
Week ending									
Oct. 5....	.104	.121	.560	*	.169	.167	.052	.175	.183
Oct. 12....	.105	.121	.540	*	.168	.167	.051	.176	.186
Oct. 19....	.106	.121	.531	*	.169	.165	.049	.178	.186
Oct. 26....	.107	.122	.517	*	.167	.165	.048	.170	.187
Nov. 2....	.107	.123	.495	*	.166	.165	.048	.177	.188
Nov. 9....	.108	.122	.506	*	.166	.166	.047	.178	.191
Nov. 16....	.108	.121	.494	*	.163	.165	.046	.178	.191
Nov. 23....	.109	.122	.489	*	.162	.163	.045	.176	.195
Nov. 30....	.109	.124	.484	*	.161	.162	.045	.179	.193
Dec. 7....	.109	.123	.479	*	.159	.160	.045	.178	.193
Dec. 14....	.109	*	.474	*	.158	*	.045	.179	*
Dec. 21....	.109	*	.476	*	.157	*	.044	.179	*
Dec. 28....	.109	*	.490	*	.158	*	.046	.180	*

* Indicates no quotations from Canada, or, if quoted, are quoted on unit bases not readily reduced to the United States unit.

TABLE VII—(*Concluded*).

STATEMENT SHOWING AVERAGE OF PRICES, WEEK BY WEEK, DURING THE QUARTERLY PERIOD FROM OCTOBER 5, 1918, TO DECEMBER 28, 1918, ON 28 STAPLE FOOD ARTICLES FOR THE UNITED STATES AND ON 22 FOR CANADA

Average price for	Canned tomatoes No. 2 can		Canned peas No. 2 can		Canned corn No. 2 can		Canned salmon tall red No. 1 can	
	United States	Canada	United States	Canada	United States	Canada	United States	Canada
The quarter	$.176	$.165	$.191	$.198	$.188	$.242	$.314	$.336
The week ending								
Oct. 5	.175	.169	.188	.200	.186	.242	.308	.333
Oct. 12	.174	.169	.189	.200	.186	.243	.308	.330
Oct. 19	.175	.168	.190	.202	.186	.246	.310	.334
Oct. 26	.174	.167	.189	.199	.187	.244	.312	.336
Nov. 2	.175	.165	.191	.199	.189	.244	.313	.336
Nov. 9	.175	.165	.191	.200	.189	.242	.313	.338
Nov. 16	.176	.164	.190	.198	.189	.242	.315	.337
Nov. 23	.176	.161	.191	.194	.189	.239	.316	.337
Nov. 30	.176	.159	.193	.194	.189	.242	.315	.341
Dec. 7	.176	.158	.193	.193	.190	.239	.317	.337
Dec. 14	.179	*	.193	*	.189	*	.317	*
Dec. 21	.179	*	.192	*	.189	*	.317	*
Dec. 28	.179	*	.194	*	.190	*	.317	*

Average price for	Fish lb.		Hens lb.	Tea lb.		Coffee lb.	
	United States	Canada	United States	United States	Canada	United States	Canada
The quarter	$.258	$.176	.$353	$.651	$.621	.$291	$.463
The week ending							
Oct. 5	.256	.173	.353	.645	.610	.285	.455
Oct. 12	.261	.178	.353	.641	.616	.284	.450
Oct. 19	.251	.176	.352	.646	.617	.285	.461
Oct. 26	.253	.175	.355	.650	.622	.286	.461
Nov. 2	.254	.175	.355	.645	.624	.288	.465
Nov. 9	.257	.175	.355	.653	.623	.286	.464
Nov. 16	.257	.177	.350	.651	.620	.288	.462
Nov. 23	.256	.174	.353	.662	.621	.290	.468
Nov. 30	.259	.178	.355	.656	.625	.290	.464
Dec. 7	.259	.178	.351	.650	.627	.294	.466
Dec. 14	.260	*	.351	.653	*	.298	*
Dec. 21	.265	*	.351	.648	*	.303	*
Dec. 28	.263	*	.351	.657	*	.303	*

* Indicates no quotations from Canada.

OBITUARY NOTE.

Anders Nicolai Kiaer was born at Drammen, Norway, on September 15, 1838, and died at Christiania, April 16, 1919, when he was eighty years of age. Most of his working life was devoted to the study of statistics, national and international, and for a period of more than fifty years, beginning before the sixth International Statistical Congress at Florence in 1867, and ending after the fourteenth and latest biennial session of the International Statistical Institute at Vienna in 1913, he toiled in this field. The International Statistical Congresses elicited the publication of various works on international statistics and among them one by Kiaer on international shipping statistics published in four parts, between 1876 and 1892, and dealing with the merchant marines of various countries, the movement of shipping, and the diverse systems of harmonizing them.

Kiaer attended the Jubilee meeting of the Royal Statistical Society at London in 1885, a leading object of which was to consider the possibility of establishing an International Statistical Association, and there he took part in renewing the ties binding together the statisticians of the various countries, ties many of which had been broken as a result of the Franco-Prussian War and the termination soon after of the series of International Statistical Congresses. At that time the International Statistical Institute was founded, an organization which for thirty years has had one of its vice-presidents a Frenchman, and one a German, while its three presidents have been chosen in succession from England, Austria and Italy. Throughout these thirty years no member worked more unremittingly than Kiaer for the welfare and productivity of the new association, and at the end he shared with Major Craigie the distinction of having attended all but one of the fourteen biennial sessions of that body. He was among the ten Europeans, only three of whom, I believe, survived him, who attended the one meeting of the Institute which has assembled

outside of Europe, that at Chicago, in 1893. He presented to the Institute several committee reports on the representative method in statisticsas distinguished from the method of complete enumeration and on demographic inquiries in little known countries or those in which no census had ever been taken. But in later years no subject absorbed more of his time than the birth rate and the fertility of marriages. At the Berlin session of 1903 he made a report on it and presented two works dealing with it, one Norwegian, the other international, which he had recently published. Two years later, at the London meeting, he offered another report on these themes, and again at Christiana in 1897 a further report came from the same source.

W. F. W.

AN ATTEMPT AT A STATISTICAL DETERMINATION OF THE BIRTH RATE IN THE UNITED STATES

BY A. N. KIAER, EX-DIRECTOR OF THE STATISTICAL BUREAU OF NORWAY, HONORARY MEMBER OF THE AMERICAN STATISTICAL ASSOCIATION.

The following article was the author's last work and unfortunately he did not live to see it through the press. As the biographical sketch indicates, hardly any writer anywhere and probably no American is more familiar than Director Kiaer with the abundant statistical literature dealing with the fall of the birth rate in most civilized countries. The present study is of importance as an example of method in this field in a case where registration figures are inadequate or lacking.

Internal evidence seems to indicate that the writer did not have access in Norway to certain primary American sources and recent official publications, and that at some points, as was natural and almost inevitable, he misunderstood American practice. Had he lived, these defects would doubtless have been brought to his attention through correspondence and corrected by him. In view of his death, it has seemed well to publish so much of the study as has methodological value, and at the same time to point out in editorial notes how his material might have been supplemented or his interpretations modified. The article grew in part out of correspondence with an American friend, Walter F. Willcox, to whom the manuscript was sent and by whom it has been prepared for publication. Those changes which call attention to other material or involve a probable difference of judgment between author and editor have been signed in order that the source of each statement or query may be made clear.

In May, 1918, Dr. Kiaer wrote a long letter to Dr. Willcox about an international study of the falling birth rate upon which he was engaged, and asked advice on certain points regarding the birth rate in the United States and its changes. This letter at the close raised these questions.

1. May it be assumed that the infant mortality in the United States is about the same as in Massachusetts?

2. May it be assumed that the general mortality in the United States exceeded the mortality of the registration area in the same year by 4 or 5 per cent.?

3. Is it probable that the difference between the reported birth rate in Maine, Vermont, Massachusetts, Connecticut and Michigan taken together and the unknown birth rate in the whole United States decreased by a little more than one-half between 1898 and 1908 as the writer's figures indicated?

4. Is it probable that the number of alien emigrants from the United States in the period 1901–07 was about 32 per cent. of the number of alien immigrants in the same period?

These questions were received by Dr. Willcox in the summer of 1918, when the government work upon which he was engaged prevented his giving them the time and attention which their importance and the standing of the writer would have otherwise demanded. The following paragraphs from his reply of July 25, 1918, will aid the reader to follow Dr. Kiaer's argument in the article.

"With regard to your assumption that the infant mortality in the United States is probably not far from the same as that in Massachusetts, I am disposed to believe you have chosen the best obtainable basis, but that the infant mortality in Massachusetts is less, not greater, than that of the country as a whole.

"My reasons for this opinion are two. In the first place the public health movement in this country began earlier and has probably gone farther in Massachusetts than in any other part of the country. This is the universal opinion which has now found some support and basis in an excellent report of Dr. C. V. Chapin on the work of the various state boards of health in which, after devising a marking system, he concludes that Massachusetts is doing the best work in public health, with New York and Pennsylvania ranking nearly side by side in second place.*

*Charles V. Chapin, Report on State Public Health Work based on a Survey of State Boards of Health made under the Direction of the Council on Health and Public Instruction of the American Medical Association, Chicago, 1916, pages 193 ff. Whether these three states still stand in the same relative position as when the survey was made may be doubtful.

"The other reason is that Massachusetts, notwithstanding the large number of foreign born, has a better educated population than the average and a very small proportion of Negroes among whom the infant mortality is very high.

"I reconcile this opinion with your conclusion that the infant mortality in the registration area is apparently less than that in Massachusetts,* by suggesting that infant deaths are less completely registered in other parts of the registration area, especially the states recently added to that group, than they are in Massachusetts. I am convinced that in most parts of the registration area, and especially in the rural districts, not a few deaths go unrecorded and that such omissions are more common among infants than among adults. Consequently, if I were to modify the infant mortality rates of Massachusetts for your purposes, I would increase rather than decrease them.

"Mr. Gannett's argument which you mention,† like that of Mr. King on the same subject in the *Political Science Quarterly* which you do not mention,‡ is unconvincing because neither takes account of the change in the form of the age question in 1890 and because both assume that the results of a census may be checked by the results of registration, whereas in my opinion, at least under American conditions, the census is the more accurate measure and registration figures should if necessary be adjusted to agree with those of the census.

"Your second question, whether the death rate in this country is probably about the same as that of the registration area increased by perhaps 4 or 5 per cent. is discussed in my paper

* With this conclusion of Dr. Kiser's should now be compared the results reached in the Census Bureau's first and second annual reports on birth statistics for the registration area for births, including in 1915 the New England States, New York, Pennsylvania, District of Columbia, Michigan and Minnesota, and, in 1916, the same states with Maryland. The yearly deaths of children under one year of age per 1,000 living births shown by these reports were:

	1915.	*1916.*
Registration area	100	101
Massachusetts	101	100

showing that the infant mortality in Massachusetts is a fair representative of that in the registration area for births, but in no wise invalidating Dr. Kiser's conclusion that the infant mortality in Massachusetts was higher than the average in the registration area for deaths which included many more states than the registration area for births. W. F. W.

† Am. Stat. Assn. Publications, IV (1894): 99–102.

‡ Pol. Sce. Q. 12 (1897): 608–621.

on the death rate of the United States in 1900.* My reasons for thinking that there are, or were in recent years, significant omissions in the recorded deaths in New York State are set forth in various reports as consulting statistician to the New York State Department of Health, and in this respect I believe that New York is better off than most of the registration states.

"Regarding your third question, I believe that the difference between the birth rate of the United States and that of the five registration states did diminish to a significant degree between 1898 and 1908, but find it hard to accept the conclusion of your argument that the difference was reduced by more than one-half.

"The number of alien emigrants from the United States between 1900 and 1907 was probably more rather than less than one-third of the number of alien immigrants in the same period.

"On these four points, as you will see, I am in substantial agreement with your conclusions. The main question raised in my mind by your discussion is whether our American figures in these various fields are accurate enough to justify as refined an analysis as you have given them. I have hesitated to make a study of the birth rate in the United States or even in any of the states, because I have much doubt of the trustworthiness of the registration figures over a series of years. Still I hope very much that you will be able to prepare an article on this subject for the American Statistical Association."

After these preliminary explanations the substance of Dr. Kiaer's article follows:

How should the birth rate of the United States be estimated?

The American Census of 1900 gives the following information about the statistics of births: "In the census reports of 1880 and 1890 the number of births in the census years was estimated by adding to the number of living children returned as under one year of age on June 1 of each census year, the number who were born during the year but died before the date of the enumeration. . . . Unfortunately both factors are erroneous to a certain indeterminate extent. . . . The method of estimating the number of births in the census year,

* Am. Stat. Assn. Publications X (1906): 137.

by addition of the population under one year of age and the 'born and died' has been followed in part . . . at the present census."*

As this subject touches a fundamental point in the whole matter it is necessary to examine it at some length. It is obvious that if each of these two figures is correct their sum would give the number of births in the year before the census. In this way the births in Massachusetts were estimated.†

Children under one year of age enumerated June 1, 1900	60,492
Born and died in preceding year	6,736
Total births in census year	67,228

With this figure showing the estimated number of births in Massachusetts June 1, 1899, to May 31, 1900, we may compare the results of registration by averaging the births reported in 1899 and 1900, or by adding seven-twelfths of the births of 1899 to five-twelfths of the births in 1900. The former method shows 71,678 births in the census year, the latter 71,922, and the larger figure seems the better.‡

The best way to find the birth rate of a registration state with good records of births is to divide the number of births registered by the enumerated population. As far as I know this can be done with accuracy only for Massachusetts.§

The number of births in that state within the five-year period preceding June 1, 1900, was 359,581.‖ The next step is to compute how many deaths would have occurred among

* Twelfth Census (1900), Vol. III, p. xlix. The Census of 1910 did not give any attention to the statistics of birth.

† *Ibid.*, p. 356.

‡ The facts that Dr. Kiaer at this point quotes March's Stat. Intern. as his authority and that he does not anywhere in the article mention the Massachusetts registration reports in which births are shown by months, suggest that he may not have had access to that series. The number of births registered in the census year was 71,650 or 28 more than Kiaer estimates by one method, and 216 less than he estimates by the other. The estimate of the census thus falls short of the number registered by 4,422 or 6.2 per cent. W. F. W.

§ With this opinion I cannot agree. The best test of the completeness and accuracy of birth registration in American states results, perhaps, from an effort to find a birth report for every infant whose death is reported. Recently the Bureau of the Census applied this test to the records of the New England States in 1916. In order of birth certificates not found, the states ranked as follows: New Hampshire, 5.6 per cent.; Vermont, 5.7; Massachusetts, 8.7; Maine, 9.5; Connecticut, 15.2; Rhode Island, 18.3. W. F. W.

‖ March, Stat. Intern., p. 44.

these births. March gives for each calendar year the deaths in Massachusetts at each year of age under five,* and from these figures we can estimate the number of deaths before June 1, 1900, among children born in Massachusetts between June 1, 1895, and May 31, 1900, inclusive, by using the following ratios derived from Norwegian, Swedish and German statistics.

Year of Age at Death.	*Per Cent. of Children Dying Who Were Born in*	
	Later Calendar Year.	*Earlier Calendar Year.*
Under 1	70	30
1	60	40
2	55	45
3	50	50
4	50	50

As these three countries showed no marked differences it seems safe to apply the foregoing ratios to Massachusetts and assume for example that of children under one year of age dying between June 1, 1895, and May 31, 1896, about 70 per cent. had been born in the same period. On these assumptions 63,559 deaths would have occurred before the census in the quota of 359,581 births and 296,022 would survive. But the census found only 282,237.

As some of these were foreign born and others were natives of the United States, but not of Massachusetts, the next step is to estimate the balance of immigration and emigration among children under five years of age. Those in the state in 1900, who had been born abroad, numbered 6,846.† The number in Massachusetts born in other American states and the numbers in foreign countries or in other American states born in Massachusetts are unknown and must be estimated. We turn first to figures for the entire country. In 1900 there were in the United States 52,487 foreign born white children under five years of age, and 53,271 such foreign born children of all races. During the years 1908–10 the emigrants of all ages were 32 per cent. as numerous as the immigrants, and Mr. Willcox is of the opinion that between 1900 and 1907 the pro-

* *Idem.*, p. 819.

† Twelfth Census, Vol. II, p. 50.

portion was still larger.* But this proportion applies to persons of all ages, and for children under five years of age it may be very different. To estimate what it was, Swedish figures may be used. During the decade 1901–10 there were 13,195 children under five who left Sweden for non-European countries, and 7,000 such children entered Sweden, showing that the immigration of children largely from the United States was about 53 per cent. of their emigration, largely to the United States. But during the three years 1908–10 there were 431,050 alien immigrants to the United States under fourteen years of age (the number under five is not reported), and 38,046 such alien emigrants, or about 12 per cent. of the immigration, and for later years the ratio was similar. It seems probable that children born in the United States of alien parents and leaving the country with their parents were not counted as aliens and that this difference of practice explains the divergence between the Swedish and the American ratios. If that be so, the Swedish ratio is the one applicable to the present problem, and we may assume that American born children under five years of age leaving the United States are about one-half as numerous as such foreign born children arriving in the United States.† For the same reason we may assume that the number of children born in Massachusetts and migrating to some foreign

* Compare Am. Econ. Review. Supplement to Vol. 11, No. 1 (1912), pp. 66 ff.

† Dr. Kiaer's method is sound, but I suspect that he has misunderstood American figures and, in consequence, misinterpreted American conditions. Probably persons born in the United States and living in Canada are far more numerous than those living in any other foreign country. There were, 1,179,807 Canadians by birth in the United States in 1900, and 127,899 natives of the United States in Canada in 1901. From these figures it seems safe to infer that the number of American born children living in Canada was not far from 11 per cent. of the number of Canadian born children living in the United States. Even more significant are the figures for certain European countries. Thus in 1900 there were 840,513 persons living in the United States who had been born in England or Wales, and in 1901 there were 16,668 persons living in England and Wales who had been born in the United States. It seems safe to infer that the number of American born children living in England and Wales was not more than 2 per cent. of the number of English born children living in the United States. Following the same line of argument it seems probable that the number of American born children under five years of age living in the main countries of Continental Europe, France, Italy and Germany, in 1900, was not far from 2 per cent. of the number of children born in the foreign country and living in the United States. From a study of foreign censuses I inferred in 1899 that not far from 170,000 persons who had been born in the United States were living, in 1890, in foreign countries (The Decennial Census, p. 20). By 1900 that number had risen to perhaps 210,000 as a result mainly of an increase in American migration to Canada. If these figures are even approximately correct the emigration of natives of the United States during the years before 1910 was about 2 per cent. of the immigration of persons born abroad. W. F. W.

country is about one-half of the children born abroad and migrating to Massachusetts.

The next step is to estimate the interstate migration of children under five years of age. As the foreign born white children under five years of age in Massachusetts in 1900 were 0.81 per cent. of all the foreign born white in the state, it may be assumed that, of all the natives of other states living in Massachusetts and of all natives of Massachusetts living in other states, 0.81 per cent. also were under five years of age.* Arguing from these assumptions it appears that the number of children under five years of age in Massachusetts on June 1, 1900, as estimated from the sum of births and immigrants diminished by the sum of deaths and emigrants, should have been 296,022 which is 16,385, or 5.8 per cent., more than those found by the census. It seems best to accept the larger total.

The annual average number of births in Massachusetts between June 1, 1895, and May 31, 1900, was 71,916, and the estimated population at the middle of the period after making various adjustments was 2,722,825, from which the birth rate is computed at 26.41 per 1,000. The birth rate for the period from June 1, 1905, to May 31, 1910, computed in the same manner, was 25.14. For 1910 it appeared that the number of children enumerated should be increased by 9.02 per cent.

The method employed in these computations is applicable only to states in which registration is substantially complete. In other states, however, approximate results may be reached through inferences or assumptions based on the Massachusetts statistics or on those of other countries.

In this discussion, infant mortality figures are of primary importance because the number of deaths among the children born within a fixed period before the census day is the essential link between the registered number of births and the enu-

* Here again the method is sound, but better figures than those to which Dr. Kiaer applied it are obtainable. From the Massachusetts census of 1885 (Vol. I, pp. 572 ff.) it appears that of the 297,834 natives of other American states then residing in Massachusetts 7,307, or 2.5 per cent., were under five years of age. For estimating the number of children born in other states and residing in Massachusetts at other dates, this proportion seems the best obtainable. For estimating the number of children among the natives of Massachusetts residing in other states the most that can be claimed for this ratio of 2.5 per cent. is that it is probably nearer the truth than the one adopted in the text. The figures at least suggest that the proportion of children among interstate migrants is several times as great as that among international migrants. W. F. W.

merated number of children living. The next step, therefore, is to estimate the mortality of children under five years of age in the United States. If the infant mortality figures of Massachusetts be taken as the starting point, allowance must be made for two differences between these population groups, the higher proportion of urban population in Massachusetts, and the lower proportion of colored. They are shown in the following comparison.

	Per Cent.		*Per Cent.*	
	White.	*Colored.*	*Urban.*	*Rural.*
		1900.		
United States	87.9	12.1	40.5	59.5
Massachusetts	98.7	1.3	91.5	8.5
		1910.		
United States	88.9	11.1	46.3	53.7
Massachusetts	98.8	1.2	92.8	7.2

What is the death rate of white children in American cities? The urban death rate of white children under one year of age per 1,000 living population of that age was

	Death Rate of White Infants in Cities.	
	1900.	*1910.*
In Massachusetts	190.6	166.6
New York	178.3	148.8
Pennsylvania	.....	158.7
Original registration states	180.0	156.6
Registration area	171.1	.....

In view of the evidence that public health work in Massachusetts is more efficient than in most other parts of the United States, the foregoing figures showing a higher mortality in Massachusetts at both dates suggest that, outside of Massachusetts at least, there were probably significant omissions in the recorded deaths of infant children.

A similar examination of the urban death rate of white children one to four years of age, inclusive, yields different results.

	Death of White Children One to Four Years of Age in Cities.	
	1900.	*1910.*
In Massachusetts	22.5	16.1
New York	27.8	19.1
Pennsylvania	....	19.6
Original registration states	24.9	17.5
Registration area	23.6	....

For this age period Massachusetts had at each date the lowest death rates, and the rates in the cities of the original registration states exceeded those in Massachusetts by about 10 per cent. In view of the uncertainty about the death rates of children under one year of age, and the much greater accuracy of the death rates at ages one to four, it seems admissible to assume that the death rates of white children under one year of age in the cities of Continental United States, as a class, exceeded the rate in Massachusetts cities by about 10 per cent. On that hypothesis the rates would be 190.6+19.1 or about 210 in 1900, and 166.7+16.7 or about 183 in 1910. For white children one to four years of age it seems best to extend the average rate in cities of the registration states to all American cities.

What is the death rate of colored children in American cities?

In attacking this problem we cannot start with Massachusetts because the number of colored in its population is very small and the health conditions among colored in the state are not representative. Perhaps the best starting point is the death rate of colored children in cities of the original registration states. These should be increased 10 per cent. as the rates for white children were to allow for the probable excess in the rates outside of the registration states. On this hypothesis the death rates of colored children in cities were

	Under One Year.	*One to Four Years.*
1900	397.+39.7=437	55.7+5.6=61.3
1910	325.8+32.6=358	39.6+4.0=43.6

What is the infant mortality in the rural districts of the United States?

In his article on the "Death Rate in the United States in 1900," Mr. Willcox expressed the opinion that there was, in the United States, "no large and representative body of rural population wherein deaths are reported with sufficient completeness and accuracy to make the resultant death rates significant." Notwithstanding this difficulty, which is less serious now than in 1900, some estimate of that mortality is necessary to further progress with the present problem. The figures for white and colored must be kept separate. The next question then is, what is the white infant mortality in the rural districts of the United States? The best starting point, probably, is the white infant mortality of cities in the effort to estimate the probable relation between rural and urban infant mortality. Taking the infant mortality in cities at 100 per cent. the infant mortality of the rural districts in certain European countries was as follows:

Ratio of Rural to Urban Infant Mortality Per 1,000 Population at Age Specified.

(Latter = 100 per cent.)

Country.	*Under One Year.*	*One to Four Years.*	*Under Five Years.*
Norway	61.7	56.2	58.2
Sweden	74.3	70.8	68.3
Denmark	67.1	59.0	61.0
England and Wales	....	....	66.6
Average	67.1	62.0	63.5

If deaths in rural districts went unrecorded more commonly than in cities this fact would reduce percentages like the foregoing. This may be true to some degree even in Massachusetts, and is probably true to an important degree in the other registration states. The following ratios show that the difference between urban and rural infant mortality is greater in the United States than in Europe.

The fact that the ratio of rural to urban infant mortality among whites in 1900 was less in the United States than in Europe is probably connected with the fact that defects of registration in American rural districts were more common than in Europe and that, if any similar difference existed

between American and European urban districts, it was smaller in amount. That the difference between urban and rural infant mortality in the United States diminished between 1900 and 1910 may plausibly be ascribed to improvements in the completeness of registration during the decade.

Ratio of Rural to Urban Infant Mortality per 1,000 Population at Age Specified.
(Latter = 100 per cent.)

	Whites.					
	1900.	*1910.*	*1900.*	*1910.*	*1900.*	*1910.*
	Under One Year.		*One to Four Years.*		*Under Five Years.*	
Original registration states .	64.4	74.0	51.4	58.6	59.0	66.8
Massachusetts.....	67.4	79.4	61.3	70.2	63.3	72.9
New York.....	57.2	76.1	40.6	51.8	49.4	65.0
Pennsylvania.....	....	86.2	....	76.0	....	81.9
	Colored.					
Original registration states .	55.1	54.8	44.7	53.8	50.9	54.3
Massachusetts.....	58.0	32.8	35.0	20.0	50.5	30.5
New York.....	44.1	47.7	28.1	38.2	36.1	41.0
Pennsylvania.....	....	69.0	....	59.8	....	62.3

The best assumption for 1900 apparently is that the death rate of white children under one year of age in the rural districts of the United States was to the same rate in the urban districts of the United States as the rate in the rural districts of Massachusetts was to the rate in the urban districts of Massachusetts, namely 67.4 per cent., a ratio very close to the average in the three Scandinavian countries, 67.1 per cent. But for 1910 the Massachusetts ratio of 79.4 per cent. seems too high to be probable. If it were correct the infant mortality in rural districts would have increased between 1900 and 1910 and that seems unlikely. The most plausible hypothesis apparently is that the white infant mortality in rural districts decreased 1900–10 at about the same rate as the white mortality at ages one to four and the urban white infant mortality. In Massachusetts the urban white infant mortality decreased 1900–10 by 12.6 per cent. and the rural mortality of white children one to four decreased by 18.2 per cent. Probably the rural white infant mortality decreased at something like

the average of these rates, namely 15.4 per cent. The death rate of white infants in the cities of the registration area decreased 1900–10 by 8.5 per cent. and that of white children one to four years old in the rural districts of the registration area by 19.6 per cent. So the death rate of white infants in the rural districts of the registration area may be supposed to have fallen in the same decade by about 14 per cent.

We turn now to the question, What is the mortality of colored infants in the rural districts of the United States? Here the Massachusetts figures afford no satisfactory basis and it is best to start with those for the registration states. Probably these suffer from serious omissions and are consequently too low. On the whole, the fairest assumption seems to be that rural infant mortality bears to urban infant mortality the same numerical ratio among colored that it does among white.

By calculations such as these the probable death rates of children under one, one to four, and under five years of age in 1900 and 1910, both for urban and for rural districts and for white and colored in each, have been estimated.

The next step is to distribute the population of the United States at 1900 and 1910 between white and colored urban and rural and children and adult, in order that the infant mortality figures adopted as a result of the previous discussion may be applied to them. To understand the method as distinguished from the results of the paper, it is unnecessary to follow the details of the argument by which these estimates are made. They lead up to a classification of the population of the United States under five years of age on June 1, 1900, and July 1, 1910 into two age periods under one and one to four, each age group into white and colored, and each race group into urban and rural, or eight groups for each date. For each of these sixteen groups a death rate had previously been determined and by multiplying the population by the rate the probable number of deaths is computed. The net result of the calculation is to yield estimated infant death rates for the population, urban and rural, white and colored, as follows:

Computed Death Rates.

Age	*Massachusetts.*		*United States.*	
	1900.	*1910.*	*1900.*	*1910.*
Under 1	177.8	160.1	179.9	161.5
1 to 4	20.8	15.3	21.9	16.8
Under 5	54.4	46.4	54.9	46.9

These figures indicate that the infant mortality figures in the United States were higher than those in Massachusetts at both dates and give some measure of the excess. The question whether the differences in these two census years were typical of those in the four earlier years for which the rates are needed is then examined with the result that it seems reasonable to assume that the mortality of children under one in the United States was in 1896–1900 about 2 per cent. higher and in 1906–10 about 1 per cent. higher than in Massachusetts, and that the mortality of children one to four years of age at both dates was about 10 per cent. higher than in Massachusetts.

With the aid of the results thus far reached it is possible to estimate the number of births in each year of the two five-year periods before the censuses of 1900 and 1910 necessary to yield the number of surviving children under five years of age called for by the census results as revised to allow for probable omissions. Then, by estimating the population in the middle of each of these ten years, the other terms of the ratio are secured and it becomes possible to compute birth rates. These computations lead to the following results:

Year.	*Estimated Population in Thousands.*	*Computed Births in Thousands.*	*Birth Rate per 1000.*	*Smoothed Birth Rate.*
1895–96	72,082	2,510	348	348
1896–97	73,383	2,443	333	333
1897–98	74,669	2,403	322	318
1898–99	75,998	2,273	299	304
1899–1900	77,389	2,277	292	292
1905–06	86,848	2,836	326	326
1906–07	88,718	2,851	321	313
1907–08	90,540	2,821	312	302
1908–09	92,090	2,521	274	292
1909–10	93,827	2,652	283	283

It will be noticed that in each five-year period much the sharpest fall in the birth rate was in the third of the four intervals. This is possibly if not probably due to errors in the census returns of children between one and two years of age, to which attention has been called in various countries. If the age returns are smoothed the resultant rates appear in the last column of the table.

Another point calling for explanation is the indicated increase in the birth rate between 1900 and 1906. This may plausibly be ascribed to the heavy immigration between those dates and its effect on the birth rate in the years immediately following. It is noteworthy that the average birth rate in the five registration states, Maine, Vermont, Massachusetts, Connecticut and Michigan, rose from 21.54 for 1901–05 to 23.84 for 1906–10, and that the most marked increase was for the year 1906.

A similar line of analysis has been carried back to include every census since the Civil War, computing the average birth rates for the three-year period and the five-year period preceding each census and averaging the results. The conclusions appear in the following summary:

Date of Census.	*Birth Rate for Preceding Period.*		*Average Rate.*	*Decennial Decrease.*
	Three Years.	*Five Years.*		
1870	380	400	390	
1880	361	389	375	15
1890	304	337	320	55
1900	306	319	312	8
1910	289	303	296	16

The excessive decline 1880–90 evidently needs explanation. That and the slight decline 1890–1900 are probably due to the change in the form of the age question in 1890 and the return in 1900 to the earlier form. If the rate in 1890 be raised from 320 to 342 to allow for this source of error and get a smooth series the birth rate in the United States underwent the following decreases figured as per cents of the initial average rate

	Per Cent. Decrease.
1868–78	4
1878–88	9
1889–98	9
1898–1908	5

indicating that the decrease during the last twenty years of the nineteenth century was much greater than during the first decade of the twentieth. In that respect the United States differs widely from most European countries where the decrease of the birth rate has been going on with accelerating speed as the following figures show.

Country.	*Average Annual Fall in Birth Rate in Per Cent. for*	
	1870–1900.	*1900–1912.*
England and Wales	0.72	1.55
France	0.58	1.17
Germany	0.33	2.02
Austria	0.64	1.15

The slower decrease in the American birth rate is probably due to the effects of heavy immigration during the early years of the present century.

To ascertain how much the annual number of births in the United States exceeds or falls short of the normal some standard of reference is needed. For this purpose the average birth rate among married women at each five-year age period of child bearing life in the three Scandinavian countries and Finland during the years 1871–94 have been accepted as the standard, and the number of births computed which would have occurred in the United States in 1900 and 1910 if the birth rate of American married women at each of the age groups had agreed with that of the corresponding group in the Scandinavian countries. Treating the results of such a computation as showing the normal number, the births in the United States in 1900 were 70 per cent. and in 1910 were 64 per cent. of the normal number. These percentages are higher than those of France, about the same as those of England, and lower than those of most other European countries.

SOME CONSIDERATIONS IN VITAL STATISTICS EDUCATION*

By Louis I. Dublin and Edwin W. Kopf.

The past decade has witnessed an encouraging growth in American vital statistics. The variety of the subjects inquired into, the expert methods employed and the increasing number of persons engaged in the work all indicate a wholesome development in this branch of knowledge. The federal registration service has been expanded until, at the present time, the records of mortality are collected and compiled for nearly 80 per cent., and the records of births for 53 per cent. of the population of the United States. The annual reports of both births and deaths, as now issued by the Bureau of the Census, are increasingly well constructed and significant documents. Tabulations of data on population structure, derived from the results of the 1910 Census, have become available in detail not displayed for any preceding enumeration. Our federal data now compare favorably with the best publications on vital statistics issued by the European countries. Along with this development have come also numerous contributions from the vital statistics offices of the several states and cities and from the laboratories of public and private agencies which have used vital statistics as an organ of public health work. It is instructive, therefore, to inquire whether, under these promising conditions, there has been a corresponding growth in the facilities for vital statistics education. Surely, the number of those who are competent to utilize the volume of data must be increased, and some thought must be given to the character and scope of the training of those who are to prepare and analyze our vital records.

For many years, the American Statistical Association was the only medium for the exchange of opinion on vital statistics practice in the United States. The early leaders of the Asso-

*Read before the annual meeting of the American Statistical Association, Richmond, Va., December 28, 1918.

ciation, including Jarvis, Elliott, Walker and Shattuck actively promoted standards of legislation and of registration in the states and advocated a programme of Federal vital statistics. The QUARTERLY PUBLICATIONS of the Association, and the constant improvement of the character of our vital statistics, bear witness to the productive work of these men. The QUARTERLY was also the means wherein standards for the registration of vital data and for their analysis were discussed by official, academic and private statisticians. The American Statistical Association played a most important part in the founding and establishing of our vital statistics. Its interests, however, were general and not specific in this particular branch of statistical science. It was necessary, therefore, that an organization with more limited aims be founded and this was accomplished in 1907, with the organization of the Section on Vital Statistics in the American Public Health Association. This group was composed, for the most part, of registrars and statisticians connected with the United States Bureau of the Census and of a number of the leading state and municipal vital statistics offices. The founding of the section at once provided a means for the dissemination of the standards which had slowly been established by the best agencies in the country. The history of our vital statistics since 1907 has centered largely around this group of public health statisticians, many of whom are members also of the American Statistical Association. Rules of approved statistical practice have emanated from this section and the registrars who, for the most part, had secured no other training than through actual contact with their official material, have obtained safe guides for the conduct of their work. While this method is not altogether satisfactory as a means of training vital statisticians, it has been until recently virtually the only one available to those who aspired to some degree of competence in this field.

A few of the universities and colleges of the country at about this time became aware of their obligation to provide instruction to qualified students, and a few actually established definite courses in vital statistics. But from a survey of the announcements of the more important institutions, it seems that there is still wide variation of opinion as to what constitutes

the material and the method of vital statistics. The definitions implied in these announcements seem to vary with the points of view of the departments in which the courses are given. In medical schools, occasional lectures on vital statistics are given in connection with courses in preventive medicine. In schools of hygiene and public health, the courses are subordinate to those on biometry, epidemiology or general public health administration. In schools of commerce and of business administration, vital statistics seems to be incidental to insurance and economics courses. The emphasis is then on the economic aspects of population and of its movement or functioning. Some of these courses are purely descriptive of the processes of registration and of tabulation of crude data; others emphasize the analytical or mathematical methods of the science to the virtual exclusion of descriptive subject matter. There is hardly any agreement upon what constitutes vital statistics; upon what elements of the science are constant in the several fields of its application; and upon what variations in the superstructure of vital statistics are necessary to teach the subject to the several types of students and workers. We shall, accordingly, in this statement, attempt to determine which groups are most in need of such instruction, and, second, to suggest a program of education in vital statistics adapted to these several groups. It is hoped that this outline will form the basis of productive discussion.

VITAL STATISTICS EDUCATION IN SCHOOLS OF GENERAL MEDICINE.

There are, first, the students of medicine, the future practitioners, who are to be the initial recorders of most of our vital statistics data, namely, those of birth, death, sickness and accident. The physicians of the country, in a very final way, determine the completeness of the count of our vital phenomena and the accuracy and the detail of statement. Instruction in vital statistics should, therefore, be planned as an essential element in their education. In view of the crowded condition of the medical curriculum, instruction should be introduced with moderation and discretion. Emphasis should be placed upon the urgency of complete and accurate registration espe-

cially of births, of deaths and the diseases causing death, and of cases of notifiable disease. Instruction should be given how properly to complete such official records. The future physician should know the uses to which such records are put by the health authorities of his community and the legal importance of these documents to his patients or their heirs. He should be familiar with the elementary processes necessary to derive the essential indices of community vital statistics such as birth rates, death rates, infant mortality rates, sickness rates, etc.

Instruction in vital statistics has, in addition, very important bearings upon the general education of the medical student. The value of future medical research will depend in some part upon the ability and readiness of physicians to record the essential facts in their cases and to derive from their records the underlying principles of their practice. The student of medicine should be taught to understand that the principles of his science are developed and advanced in two ways; first, by the so-called *intensive* and second, by the *extensive* method of observing vital phenomena and processes. The sciences of anatomy, physiology, histology and pathology represent the intensive approach. They represent the collection of facts and conclusions on the normal and abnormal in the structure and function of individuals and of their organs. They typify science in its description of individuals in terms of the individual. But the science of medicine also attempts to draw conclusions from the consideration of large groups of cases and the analysis of the data for such aggregations. The student should be taught that from this viewpoint vital statistics is in general the engine of research for establishing those conclusions which are based upon the proper observation of masses of cases. Thus, vital statistics in the school of medicine should be taught perhaps in the department of research medicine as a method of discovery of generalized medical truth.

VITAL STATISTICS EDUCATION IN SCHOOLS OF PUBLIC HEALTH.

Then there are the students and workers in public health and hygiene who must understand and use vital statistics in their specialty. In fact, the results of statistical inquiry are

the very foundation and the guide for their programmes of operation. The development of statistical data and technique in America has been and will continue to be largely in their hands. Yet the larger number of public health workers have been, for the most part, trained in the hard school of experience with only the precepts of a few successful vital statisticians to guide them. They have entered their field with perhaps a training confined to the principles and practice of medicine obtained before the days of the modern schools of public health and have received hardly any formal or systematic instruction in statistical method. This is evident to any one who examines the large number of weekly, monthly and annual reports issued by the health departments of states and cities. For the most part these reports do not as yet attain the required standards of statistical practice. A very valuable source of information is thus impaired both for the use of the public and of the specialists in health work.

The students in graduate schools of public health are now much more fortunate. Courses in vital statistics are provided and these cover the field fairly extensively. In general, their instruction seems to cover the ground of such a text as Newsholme's or of Whipple's recent book. Courses for health officers should emphasize the value of registration and the need for sound legislation for the establishment and enforcement of such registration. There should be instruction in classification technique especially for such items as statements of cause of death and of occupation. Time should be given to tabulation practice and to statistical arithmetic including the preparation of graphic representations. Such courses should, in a sense, cover the entire field of demography, embracing the amount and extent of community losses which result from the incidence of communicable disease and preventable death. In view of the fact that support of health work in the last analysis depends upon public opinion, the student should receive instruction in the preparation of reports, of health literature and of exhibits which will portray the results of his work and the need for its maintenance and extension.

VITAL STATISTICS EDUCATION FOR STUDENTS OF SOCIAL AND POLITICAL SCIENCE.

There is also that large group of students of the social and political sciences who use vital statistics. Their chief interests are to determine the facts of the progress, decline and prospects of mankind. They need, therefore, to understand the composition and structure of population; the changes in such characteristics of population and their meaning, and the losses which result from preventable disease and premature death. The gains from migration and birth are likewise within the scope of the work of these students. They are concerned with the factors which determine differential birth rates and death rates. The facts of marriage and divorce in relation to family life are of special interest to them. A course for such students should, therefore, give the principal facts of descriptive demography. Less emphasis need be placed on registration and the methods of office procedure, which are so vital to the registrar and to the public health worker, but more time must be spent on the relation of vital phenomena to other historical, social, and economic facts which bear upon the problems of life and death. Such allied considerations as family income, housing, working conditions, dietaries, etc., should be studied in relation to the public health. This will involve considerable instruction in the mathematical and logical treatment of facts. It is for this group of students especially that emphasis should be placed, in a vital statistics course, on the newer developments of mathematical statistics sufficient to qualify the student to determine the relation between variable phenomena and the degree of accuracy of the usual statistical measures.

VITAL STATISTICS EDUCATION FOR STUDENTS OF INSURANCE.

For nearly a century, actuaries and their students have been working more or less successfully in vital statistics. In fact, the higher forms of graduation and of analysis, so important in the field of vital statistics, have been developed by mathematicians and actuaries employed by the insurance companies as a necessary part of their business practice. In England and on the Continent, actuaries have laid the foundation for

vital statistics, beginning with their contribution of life tables to the analysis of the phenomena of life and death.

A profitable field for the extension of vital statistics education is afforded by the group of students who prepare themselves for a career in actuarial science. While it will not be necessary to require of them a formal and thorough course such as given to public health students, it would be desirable for them to receive instruction in vital statistics as related to mortality. These students should become acquainted with the chief sources of information on population mortality. They should be familiar with the main facts of the death rates of groups of population by color, sex and age, especially for the more important diseases as causes of death. As the field of actuarial work widens, as new elements of risk, such as disability, sickness, old age dependency, occupational hazard, are added to underwriting work, more and more attention will need to be directed to official sources of data in American vital statistics. A closer bond between actuaries and the vital statisticians should in every way be encouraged.

There has not been, however, as much coöperation between actuaries and the other groups interested in the future progress of vital statistics as there might have been. This is perhaps due to the fact that until the Section on Vital Statistics of the American Public Health Association was formed, there was no organization whereby workers in the several fields could meet on a common ground and discuss the subject. In recent years, however, certain tendencies toward coöperation have become evident. The work of the Bureau of the Census, the Actuarial Society of America and the American Public Health Association in promoting the compilation of the "United States Life Tables" is an instance of what may be accomplished when the several groups work together for a common end. The Casualty Actuarial and Statistical Society has already endeavored to establish relations with those groups of vital statisticians who are interested in the subjects not comprised in the work of the life actuarial field. Subjects such as sickness statistics, especially the statistics of hospitals and other institutions, accident statistics, especially the facts for workmen's compensation cases, and other matters have been brought into the common

field of the casualty actuary and the public health vital statistician, and discussed to great advantage.

In the foregoing text we have described various groups of students using vital statistics and its methods. It may be well at this point to condense the various suggestions as to programme into one statement, and this may be done as follows. These several groups of students need to be informed as to the content and purpose, first, of statistics in general, as a mode of approach to the facts of life, and second, as to vital statistics.

A BASIC PROGRAMME.

Statistics should be defined and taught as the method of collecting, tabulating and interpreting the facts for groups of persons, things, or events in terms of the groups. It should be shown that statistics produce various facts, whatever the subject-matter, and of these there are: (a) concrete facts of the kind or sort categories into which the individuals composing a group may be arranged, (b) the size classes into which the individual variates of a given kind or sort category may be displayed, (c) the convenient "shorthand" or averaging devices of statistics which enable one to grasp ideas of the size-type of a group; the degree of diversity of the individuals composing the group; the degree of association or correlation between one character of the group as compared with some other characteristic of the group, or with the same character of another group; the degree of symmetry of the distribution of the individuals composing the group. There should also be some instruction in the theory of probabilities as a means for determining the degree of approximation or reliability of the statistical measures employed, and in applied logic to test the validity of conclusions. Vital statistics, it should be shown, is the application of these methods and conceptions of statistics to vital phenomena.

Vital statistics itself may be further classed according to whether it treats of (a) the structure or composition of populations (static demography) and (b) the movement or functioning of such populations and their sub-divisions (dynamic demography). Under the subject of the structure and composition

of population, the student should be taught the history and methods of census taking, the classification, tabulation and significance of the principal facts of population according to families, sex, age, country of birth, color or race, parentage, degree of education, mother tongue, etc. That branch of vital statistics which deals with the movement of population should take up in the descriptive and interpretive mode, the facts of birth, marriage, divorce, sickness, death and migration. In the treatment of these several subjects, the concepts and practical methods of statistics in general should be applied.

Under method, practical laboratory instruction should be given in the drafting of inquiry and registration schedules, the practical editing and criticism of returns, the preparation of tabulation sheets, cards, etc., the management of mechanical tabulating systems, of computing machines and reckoning devices, in the technique of authorship, in filing, finding and, the other disposition of published results, in graphic technique and in personal and office efficiency.

FOOD EXPENDITURES BY MEN AND WOMEN.

By Horace Secrist

In budgetary studies it is customary in apportioning family expenditures for food among the members to place the husband and wife in the ratio of 100 to 90.* The evidence in support of this distribution is frequently not given, and in some cases, undoubtedly, it rests on nothing more substantial than mere assumption.† As throwing light on this relationship, the results of a study recently conducted in the statistical laboratory of Northwestern University into the expenditures for food by men and women—mostly students and business people—at a local cafeteria may be of some value. They are given here in rough outline only, no more definite analysis being offered than the nature of the data seems to warrant.

In summary, it may be said that the result supports very closely the commonly used ratio of 90 per cent. for women to 100 per cent. for men.

The data were secured from the manager of a local (Evanston, Ill.) cafeteria, distinction being made by him on the checks paid by each customer, (1) between adults and children,‡ (2) between men and women, (3) between the days of the week, (4) between the meals of the day. Details were secured for one week, January 19 to 25, inclusive, 1919, and cover 6,843 individual meals. On the basis of 365 individual meals per year they represent an experience for breakfast of 2.29 years; for dinner, 8.86 years; for supper, 7.60 years; and for all meals (1,095 per year), 6.25 years. Stated in another way,

*See, for instance, Monthly Labor Review, United States Bureau of Labor Statistics, October, 1917, p. 6; *ibid.*, December, 1918, p. 115.

†". . . the relative consuming powers of the different members of the normal families were estimated after careful comparison and study, and on the basis of these estimates it was assumed as generally true for the purpose of this table—1, that all husbands consume a like amount of food; 2, that the wife consumes 90 per cent. as much food as the husband. . . ." Eighteenth Annual Report of the Commissioner of Labor, 1903, p. 102.

"In general, it appears that the food requirements of men and women of equal activities are in proportion to their bodily weights, and the amounts required by children varies primarily with age. Women, on the average, weigh about eight-tenths as much as men, and it is commonly assumed that if equally active their food requirements will stand in the same proportion." Monthly Review, December, 1917, p. 6.

‡ Inspection alone was relied on for this purpose, the age distinction being 14 years.

the data represent for an individual man or woman yearly experiences for each of the meals as follows:

TABLE I.

TABLE SHOWING FOOD EXPENDITURE EXPERIENCE IN YEARS.

Meals	Men (years)	Women (years)
Total	2.65	3.60
Breakfast	.98	1.31
Dinner	3.81	5.05
Supper	3.14	4.46

The distribution of the instances by meals and by the sex of the purchasers is as follows:

TABLE II.

TABLE SHOWING NUMBER AND PERCENTAGE OF FOOD PURCHASERS BY MEALS.

Meals	Total		Men		Women	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Total	6,843	100.0	2,897	100.0	3,946	100.0
Breakfast	836	12.2	359	12.4	477	12.1
Dinner	3,233	47.3	1,391	48.0	1,842	46.7
Supper	2,774	40.5	1,147	39.6	1,627	41.2

The following table shows for the men and the women both the number of purchasers and the average expenditure per meal as well as the ratio of the average amount expended by women to that expended by men:

TABLE III.

TABLE SHOWING BY MEALS THE NUMBER OF PURCHASERS OF FOOD, THE AVERAGE EXPENDITURE AND THE RATIO OF EXPENDITURE, BY MEN AND WOMEN.

Meals	Total		Men		Women		Ratio of Expenditures—Women to Men
	Number	Average Expenditure (cents)	Number	Average Expenditure (cents)	Number	Average Expenditure (cents)	
Total	6,843	35	2,897	38	3,946	33	86.8
Breakfast	836	21	359	23	477	19	82.6
Dinner	3,233	35	1,391	38	1,842	32	84.2
Supper	2,774	39	1,147	42	1,627	37	88.1

The table above shows that the average expenditure for both men and women for the 6,843 meals was 35 cents, and that the ratio of the average expenditure for all of the meals was 86.8 to 100.0 for women and men. It is interesting to note that the ratio increases with the amount of the expenditure.

The following table classifies the expenditures in the same manner as Table III, but shows the days of the week separately:

TABLE IV.

TABLE SHOWING BY DAYS OF THE WEEK, THE NUMBER OF PURCHASERS OF FOOD, THE AVERAGE EXPENDITURE AND THE RATIO OF EXPENDITURES BY MEN AND WOMEN.

Days	Total		Men		Women		Ratio of Expenditures—Women to Men
	Number	Average Expenditure (cents)	Number	Average Expenditure (cents)	Number	Average Expenditure (cents)	
Total.....	6,843	35	2,897	38	3,946	33	86.8
Sunday (b)...	753	43	335	47	418	40	85.1
Monday (a)..	922	35	399	38	523	33	86.8
Tuesday.....	1,080	34	449	37	631	31	83.8
Wednesday ..	985	33	429	36	556	31	86.1
Thursday....	1,122	33	481	34	641	32	94.1
Friday.....	1,091	34	453	37	638	33	89.2
Saturday	890	35	351	39	539	33	84.6

The ratios vary from 83.8, as a minimum, to 94.1, as a maximum, with 86.8 as the average. By classifying the days, the meals and the sexes of the purchasers the following ratios of expenditures by women and men are secured:

TABLE V.

TABLE SHOWING BY DAYS OF THE WEEK AND BY MEALS THE RATIOS OF EXPENDITURES FOR FOOD BY MEN AND WOMEN.

Days	Ratios of Expenditures—Women to Men		
	Breakfast	Dinner	Supper
Sunday.....	83.3	90.7	(b)
Monday.....	(a)	85.3	88.1
Tuesday.....	82.6	82.9	88.1
Wednesday.....	100.0	82.4	90.5
Thursday.....	81.0	87.9	90.5
Friday.....	90.5	83.3	92.9
Saturday.....	79.2	86.1	81.8

(a) No breakfasts.
(b) No suppers.

While the above comparisons are made on the basis of the average (arithmetic mean) expenditure, the same general relations are found to hold when the medians and quartiles of the respective groups are compared. In the table below, these ratios are set out in detail:

TABLE VI.

TABLE SHOWING THE RATIOS OF EXPENDITURES FOR FOOD BY MEN AND WOMEN BASED ON THE ARITHMETIC MEANS, THE MEDIANS AND THE QUARTILES.

Meals	Ratios of Expenditures for Food, Women to Men, based on			
	Arithmetic Means	Medians	First Quartiles	Third Quartiles
Total	86.8	81.6	85.2	89.5
Breakfast	82.6	86.4	88.2	82.1
Dinner	84.2	81.1	82.1	87.2
Supper	88.1	88.6	84.9	90.4

The ratios are noticeably stable for the different averages, varying for all meals from 81.6, as a minimum, in the case of the median, to 89.5 as a maximum, in the case of the third quartile. For the individual meals, dinner, on the basis of the median, with a ratio of 81.1, has the lowest ratio, and supper, on the basis of the third quartile, with a ratio of 90.4, has the highest ratio. Of course, this is only another way of saying that the distributions in the expenditure series for men and women have the same general conformation, the difference of approximately 14 per cent. being constant for the averages taken. Other summary expressions, as for instance, the decils, would reveal the same general relationship.

The actual expenditures by five-cent groups for the sexes and the meals separately are given in the following frequency table.

TABLE VII.

TABLE SHOWING THE EXPENDITURES FOR FOOD BY MEN AND WOMEN AND BY MEALS.

Expenditure Groups (cents)	Meals and Purchasers of Food											
	Total			Breakfast			Dinner			Supper		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Total.....	6,843	2,897	3,946	836	359	477	3,233	1,391	1,842	2,774	1,147	1,627
3 to 7 ..	15	7	8	5	1	4	6	2	4	4	4	—
8 to 12 ..	188	64	124	84	25	59	57	12	45	47	27	20
13 to 17 ..	516	150	366	252	91	161	183	39	144	81	20	61
18 to 22 ..	763	230	533	220	87	133	356	98	258	187	45	142
23 to 27 ..	982	343	639	134	65	69	552	186	366	296	92	204
28 to 32 ..	849	345	504	70	42	28	497	211	286	282	92	190
33 to 37 ..	672	315	357	34	25	9	350	179	171	288	111	177
38 to 42 ..	758	334	424	19	11	8	336	174	162	403	149	254
43 to 47 ..	702	351	351	14	12	2	297	164	133	391	175	216
48 to 52 ..	563	307	256	2	—	2	224	120	104	337	187	150
53 to 57 ..	407	223	184	1	—	1	159	89	70	247	134	113
58 to 62 ..	179	106	73	—	—	—	77	47	30	102	59	43
63 to 67 ..	100	49	51	—	—	—	60	29	31	40	20	20
68 to 72 ..	75	37	38	—	—	—	38	23	15	37	14	23
73 to 77 ..	36	16	20	—	—	—	18	7	11	18	9	9
78 to 82 ..	17	11	6	—	—	—	9	5	4	8	6	2
83 and over	21	9	12	1	—	1	14	6	8	6	3	3

ON FUNCTIONAL RELATIONS FOR WHICH THE COEFFICIENT OF CORRELATION IS ZERO.

By H. L. Rietz, *University of Iowa.*

The recent papers of Reed* and Harris in these Publications have brought to my mind some simple cases in which a correlation coefficient is zero although the two variables are mathematical functions of each other represented by certain simple types of continuous curves.

Those who have studied critically the theory of correlation are perhaps aware of the limitations of this valuable theory as well as they are aware of its useful applications. But those who are making applications without fundamental knowledge of the method are apt to overlook the limitations in applying a summary method of quantitative description such as is provided by the correlation coefficient.

The following rather striking illustration should serve to make clear a limitation on the generality of the correlation coefficient as a measure of correlation. Suppose we had observed as corresponding variates the coordinates x and y in a simple harmonic motion given by

$$y = \cos \lambda x \tag{1}$$

in the interval from $x=0$ to $x=\frac{2\pi}{\lambda}$.

That is to say, let us consider the case in which we have given the corresponding values of x and y in (1) for a set of n x's in the interval from 0 to $\frac{2\pi}{\lambda}$. Let x_t and y_t ($t=1, 2, 3, \ldots, n$) be corresponding variates; $\bar{x}$ and $\bar{y}$ the mean values of x's and y's respectively; and σ_x and σ_y the standard deviations. Assume further that the points (x_t, y_t) are symmetrical about the middle point of the interval, so that $\bar{x}=\frac{\pi}{\lambda}$. Then $\bar{y}=0$. Furthermore, it is clear from symmetry of points about $(\bar{x}, \bar{y})$ that the correlation coefficient

* Reed, Vol. 15, pp. 670–684, 1917; Harris, J. Arthur, *loc. cit.*, pp. 803–805.

$$r=\frac{\sum_{i=1}^{i=n}(x_i-\bar{x})(y_i-\bar{y})}{n\sigma_x\sigma_y}=\frac{\sum_{i=1}^{i=n}\left(x_i-\frac{\pi}{\lambda}\right)(y_i-0)}{n\sigma_x\sigma_y}=0 \qquad (2)$$

Similarly, if we deal with a continuous distribution of points along the curve $y=\cos\lambda x$ where kdx (k constant) is the frequency of values in the interval dx, we have

$$r=\frac{k}{s^2}\int_0^{\frac{2\pi}{\lambda}} y\left(x-\frac{\pi}{\lambda}\right)dx,$$

where s^2 is the geometrical mean of the second moments of the distribution about the two lines $x=\frac{\pi}{\lambda}$, and $y=0$. That is to say, we obtain a correlation coefficient $r=0$ for a case where the relationship is given by the function $y=\cos\lambda x$.

If the points were distributed uniformly with respect to intervals Δx in a thin band along the curve $y=\cos\lambda x$ instead of being exactly on the curve, r would be nearly zero.

These results do not at all constitute a reflection on the use of the correlation coefficient for many purposes, but they do show that it is improper to infer that no correlation* exists because r is equal to or nearly zero.

West† states that "if the regression curve is of a certain shape the value of r will be very small even though practically perfect correlation exists." It is clear from the above illustration that it would be justifiable to strengthen this statement by saying that if the regression curve is of a certain shape the value of r would be zero in certain cases even when the one variable is a certain trigonometric function of the other.

Instead of the distribution given by $y=\cos\lambda x$, we may take the more general case $y=f(x)$ in the interval $-a$ to a where $f(x)$ is a single valued function symmetrical about the line $y=0$. When the distribution of the points in equal intervals Δx is uniform in the sense prescribed above for $y=\cos\lambda x$, we obtain for $y=f(x)$ also the result $r=0$.

* Cf. Yule, Proc. of Royal Society, Vol. 60, p. 477, 1897.
† Introduction to Mathematical Statistics, pp. 84–85.

For values of x in the interval $-a$ to a, a class of functions for which $r=0$ is given by $y=f(x)$ subject to the condition

$$\int_{-a}^{+a} xydx=0.$$

Hence, it is simply the first moment about the y-axis of areas bounded by $y=f(x)$, the x-axis, and ordinates $x=-a$ and $x=a$ that must vanish. This condition is satisfied by a variety of simple functions.

Harris holds that Reed put too much emphasis on the importance of testing the linearity of regression in the early stages of a correlation study. With this position taken by Harris, the writer is in agreement if the question is one merely of showing the existence of correlation rather than one of showing the degree of correlation; for, if regression is not linear, the value of r turns out to be smaller than the correlation ratio—a function appropriate to describe correlation without a limitation of linear regression. That is to say, the use of r does not lead us to infer a greater degree of correlation than exists, but in cases of non-linear regression it may lead us to infer a smaller degree of correlation than exists.

The interpretation of the significance of differences between two correlation coefficients cannot go far until careful inquiry is made into the form of the regression curve. The prediction of the mean value of y that corresponds to an assigned value of x is likely to be valuable only when the form of the regression curve is known.

Let us consider next the application of the correlation ratio instead of the correlation coefficient to a distribution of points given by a single valued function such a $y=\cos \lambda x$. By definition, the correlation ratio of y on x is

$$\eta_y=\frac{\sigma_{\bar{y}_a}}{\sigma_y},$$

where $\sigma_{\bar{y}_a}$ is the standard deviation of the means of arrays of y's that correspond to equal assigned intervals Δx of the variable x, when the square of the deviation $\bar{y}_x-\bar{y}$ of the mean $\bar{y}_x$ of any array from the mean of the total population $\bar{y}$ is weighted with n_x, the number in the array.

Consider the case of a set of n points on the curve $y=\cos\lambda x$ distributed so that the same number of points are found in equal intervals Δx. When each Δx is decreased so as to contain only one point, it is clear that

$$\eta_y=1.$$

Similarly, when we assume a uniform continuous distribution of points such that kdx (k constant) gives the frequency for the interval dx, we have, when dx is decreased indefinitely,

$$\eta_y=1.$$

Thus, η_y is an appropriate measure of the dependence of y on x.

Let us find next the correlation ratio of x on y for the rather artificial and freakish case from a statistical standpoint of looking upon x as a function of y for the distribution of sets of points described above. Thus,

$$x=\frac{1}{\lambda}\arccos y$$

is a two valued function of y in the interval $y=-1$ to 1, when x is restricted to the interval 0 to $\frac{2\pi}{\lambda}$. If we construct arrays of x's that fall into intervals dy, it is obvious from symmetry that $x=\frac{\pi}{\lambda}$ is the line of regression—all the means falling exactly on this line. But for the entire distribution, $\bar{x}=\frac{\pi}{\lambda}$. Hence, it is clear that the correlation ratio of x on y gives

$$\eta_x=0.$$

Thus, $\eta_x=0$ although x is a certain well known double valued mathematical function of y. Such an extreme case seems to be of value only in showing the logical character of the correlation ratio.

But $\eta_x=0$ does even in this case give the correct summary result in answer to the question as to the extent to which mean values of x tend to arrange themselves along a *single* curve, known as the curve of regression of x's on y. But this ques-

tion and answer are of little or no value when instead of an arrangement along a single curve, we have arrangements of points along two curves as cited in the illustration. The main point to be kept in mind in this connection is that the correlation ratio gives a summary description of the deviations of the points from a single valued function.

NEW MEMBERS OF THE ASSOCIATION, ELECTED JANUARY TO JUNE 1919.

Arledge, Carrie M. (Miss), 2628 Garfield St. N. W., Washington, D. C.

Armstrong, C. Dudley, Armstrong Cork Co., Pittsburgh, Pa.

Bagley, W. Nelson, F.A.S., Travelers Ins. Co., Hartford, Conn.

Bailey, Ida M., Farm Loan Bureau, Washington, D. C.

Bastin, Edson S., U. S. Geological Survey, Washington, D. C.

Becker, Joseph A., Lock Box 354, Madison, Wis.

Beckwith, Holmes, 1724 Chicago Ave., Evanston, Ill.

Behrens, Herman A., 910 Michigan Ave., Chicago, Ill.

Bessey, John M., Natl. Assn. of Mutual Casualty Cos., 233 Broadway, New York.

Bettison, P. R., Armstrong Cork Co., Beaver Falls, Pa.

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Boyle, Harold L., 501 West 121st St., New York City.

Bradford, Ernest L., Emergency Fleet Corporation, 140 North Broad St., Philadelphia, Pa.

Brehm, E. A., Western Electric Co., Philadelphia, Pa.

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Dodd, Walter L., 203 Granby St., Norfolk, Va.—†
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NOMINATING COMMITTEE FOR ANNUAL ELECTION OF OFFICERS, 1919

In accordance with Section IX of the Constitution, which requires the personnel of the Nominating Committee to be published in the QUARTERLY three months before the annual meeting, the President has appointed the following:

W. C. MITCHELL, *Chairman.*
E. A. GOLDENWEISER.
W. S. ROSSITER.

REVIEWS AND NOTES.

The Review of Economic Statistics, Preliminary Volume, Number 1, January, 1919. Harvard University Press.

Harvard University in the spring of 1917 appointed a Committee on Economic Research. An article by the chairman of this committee, Professor C. J. Bullock, printed nearly two years earlier* and doubtless one of the influences leading to the establishment of this committee, pointed out that existing provisions for economic research, confined as they are to the individual investigator and governmental agencies, are entirely inadequate. The large and increasing mass of material flowing from government sources needs careful verification and interpretation before it can be made useful. This interpretation is seldom well made by the government because in many of these fields political or social implications tie the hands of the official, color his vision of the meaning of his results, or limit him to severely practical and obvious deductions. Endowments for research in this field are sorely needed and universities are the best agencies to administer them.

The Committee on Economic Research decided to make its initial effort in the field of economic statistics and this new serial, under the able editorship of Professor Warren M. Persons, is the result.

From the fact that the subscription price of the quarterly and its monthly supplements is $100 a year it may be fair to infer that the committee plans to make at least this part of its work approximately self-supporting. But the new serial without its supplements is also to be furnished gratuitously to a limited number of university libraries.

The object of the *Review* is apparently divisible into two parts, the ultimate and the immediate purpose. The ultimate purpose "is to promote the collection . . . and interpretation of economic statistics . . . for business and scientific purposes" (Prefatory Statement). The immediate purpose is to "deal chiefly with these industrial, commercial, and financial data which ordinarily serve as the basis for judgments concerning fundamental business conditions" (*Ibid.*).

These statements suggest certain questions, such as, What is the nature and scope of economic statistics? How, if at all, does economic statistics differ from business statistics? If business purposes and scientific purposes in one or both of these fields (in case they are not identical) lead in different directions how are the two sorts of purposes to be reconciled? But this preliminary number avoids the consideration of such questions by confining its attention to the immediate purpose. We may hope that in the future the *Review of Economic Statistics* will give some share of its attention to questions of the sort just mentioned which grow naturally out of its ultimate purpose.

What of the contents of the first number of this preliminary volume?

"Perhaps the most important service rendered by such journals as the *Commercial and Financial Chronicle, Bradstreet's*, the *Iron Age* and the

*Harvard Graduate's Magazine, 23: (1914–15), 601–610.

New York Journal of Commerce is to collect and publish regularly statistical series with weekly or monthly items" (page 5). The government has given little attention to this important field. "None of the journals which collect and publish fundamental statistics apply any except the simplest and most obvious methods of analyzing the data presented" (*Ibid.*). Errors and discrepancies in the material are not infrequent. The data included are usually representative rather than complete. To the task of analyzing and interpreting these important data very little attention has thus far been given and this is the immediate work to which the *Review of Economic Statistics* hopes to contribute.

This first issue is devoted exclusively to developing a method of handling these business statistics whereby the significance of each item as an index of current business conditions can be ascertained. Perhaps some notion of this method can best be conveyed by an example and for that purpose I have chosen the monthly figures for the production of pig iron in the United States. These figures, like the others studied, are assumed as a working hypothesis to be subject to (1) a long time tendency, in this case to an increase of output, (2) a seasonal variation within the year, (3) a cyclical movement depending upon the alternation of periods of business prosperity and depression, and (4) other residual variations. This hypothesis can be proved to be correct or incorrect in any case only by contriving methods of measuring the effects of these various influences and with their aid discovering whether each influence was or was not felt.

By previous testing it had been found that of the two methods used to measure a long time tendency, namely, the method of moving averages and the method of fitting a straight line or a curve to the data, the latter was the better. So by the method of moments a straight line was fitted to the series of figures showing the annual output of pig iron 1903–16. The result indicated an annual increment in the monthly output of 95,200 tons and opened the way for so correcting the figures as to eliminate this long time tendency or secular trend from the series.

The next problem was to discover whether there is any seasonal variation in the series of figures with the further purpose, if one is found, of measuring its magnitude and introducing the needed corrections. The difficulties in the way of allowing for the different lengths of the months, calendar or statistical, and for the proper treatment of Sundays led to a decision not to attempt separating these artificial differences from the real ones due to varying degrees of activity in equal periods of time.

To determine the presence or absence of seasonal variation the graphic method was tried. This did not reveal any general seasonal variation traceable in every year or even in a majority of the years but showed rather that the seasonal variation, if present at all, was masked by the cyclical movement between prosperity and depression. This method of studying seasonal changes by examining departures from the yearly average proving unsatisfactory, attention was directed to monthly changes measured in link relatives or percentages that one month's figures make of those of the preceding month. The distribution of these link relatives in any series

usually shows a characteristic variation between two consecutive months with occasional wide departures obviously due to other influences upsetting the normal trend of change. The median is accepted as the best index of the characteristic variation between two consecutive months. By this method a measure of seasonal variation is obtained and the way is opened for estimating and eliminating the influence of these variations.

The remaining problems are to measure the influence of the alternate waves of prosperity and business depression and lastly the influence of irregular factors which occasionally interfere with or override one or more of the factors already analyzed. To the preliminary question whether there is a "law" of business cycles under which prosperity recurs at intervals defined by the recurrence of sun spots or of rainfall and other weather conditions favorable to good crops or by other causes, Professor Persons returns the answer "not proven." He finds it impracticable to separate the cyclical from the irregular fluctuations, although it is relatively easy to separate secular trend and seasonal variation from each other and from the cyclical and irregular fluctuations taken together.

The various series which thus far have been studied separately must next be compared and for that purpose some unit of each series is needed which will facilitate a comparison between the series. This need is met by recourse to the standard deviation.

At this point the discussion in the present issue comes to a close leaving for later numbers the development of a method of studying the relations of each series to the others and to general economic conditions and an examination of the question whether generalizations of the type described which have been derived from the past can be applied to the future.

The new periodical promises well and, I doubt not, will speedily make an important place for itself. If a distinction is to be recognized between economic statistics and business statistics, little in the first number indicates that the new review will devote itself to the former rather than the latter field. Nor does the word "Review" in the title seem entirely satisfactory because that word both by derivation and by usage implies that much attention will be given to evaluating the work of others. Archives or Repository or Bulletin or Contributions seems to describe more accurately than Review the probable content of the new serial. May I enter a mild protest also on behalf of the librarians. The size of the new publication, 11 by 16 inches, makes it awkward to house on shelves with other economic literature. In 1853, I believe, the American representative to the first International Statistical Congress came back with the report that he met with constant protests against the inconvenient size of the American census volumes and since that date they have uniformly appeared as quartos. No one today would think of increasing their size and much might be said for reducing it. The charts in the present issue might be divided or folded in or reduced so that a hand glass would be needed to read them. In my opinion the series would be much more serviceable if it should be reduced to a smaller page.

Cornell University. WALTER F. WILLCOX.

The War with Germany: a Statistical Summary. By Leonard P. Ayres, Colonel, General Staff. Washington: Government Printing Office, 1919. Pp. 154.

From early times the conditions of warfare have led to a recognition of the importance of quantitative values. The battle of Thermopylae is remembered chiefly because of a notable disparity in the numerical strength of the forces engaged. Collecting and preserving statistical facts is a routine function of military organizations, and the records of modern wars contain more or less information concerning the men and officers who served, casualties, prisoners taken, artillery and small arms employed, and supplies consumed.

Considered from the statistician's standpoint, the war against Germany differed from earlier conflicts, first, in the volume and diversity of the items of information assembled and, second, in the fact that the recording and collating of much of this material was recognized as a statistical task and was intrusted to skilled and experienced statisticians. The report prepared by Colonel Ayres is the first important publication, at least in the United States, in which statistical methods have been consciously applied to the administrative phases of the war.

The scope of the report is shown by the following condensed list of subjects: Men drafted; period of training; transportation of troops; production and transportation of food, clothing, equipment, motors, aircraft, artillery, rifles, and revolvers; ground gained in battle; health and casualties, and international comparisons. The report is a War Department publication, dealing only with those portions of the war against Germany in which the United States was engaged, and only with those phases of American participation which came under the direction of the Secretary of War. The work of the Navy, while mentioned with appreciation, is not described, and that of the Marine Corps is only incidentally referred to. In his letter of authorization, the Secretary of War asks for a presentation of "significant facts and figures with respect to those major steps in our military preparation and action which, taken together, constitute the record of our participation in the war." Considered with reference to these instructions, the selection of topics seems admirable. No reference is made to routine functions of the War Department affecting personnel, such as the transmission of mail between men in service and their relatives, the reporting of casualties, and the payment of the troops, which have a direct bearing on the morale of the army and the civil population. In view of public interest in these subjects any statistics which could be compiled would have been acceptable.

In plan of treatment, the report is descriptive rather than analytical. It is addressed, primarily, not to students of statistics or of history, but to all intelligent readers who wish to be informed as to the facts of the war. Where comparisons are made their purpose is to lend emphasis to the description of conditions, rather than to connect cause with effect. The

author has sought, above all, to make his presentation of facts clear and striking, and his efforts have been successful to an exceptional degree.

By the omission of details of information and descriptions of technical procedure, the report has been fitted to the requirements of the general audience to which it is primarily addressed. The condensation of statistical subject matter is a difficult task, but the data have been selected with skill. Only a few isolated instances have been noted in which the array of facts and figures appears incomplete, or the discussion insufficient.

The comparisons of the work and achievements of the different countries engaged in the war with Germany seem imperfectly descriptive because of the omission of essential factors. Thus, on page 14, there is a diagram comparing the numerical strength of the British and American armies in France during the period from 1914 to the signing of the armistice, and the statement is made that it took England three years to reach a strength of two million men, while the United States accomplished an equivalent result in one half that time. The fact that from the very outset of the war the English were forced to make good the effects of heavy casualties, and that the increase in their forces was in this way materially retarded, is referred to in the text, but it would have been well, in view of the overwhelming importance of this factor, to have based the comparison upon the numbers of men sent to France each month. Even after such a change in method, the data would have but superficial significance by reason of the difference in the populations and resources of the two nations and the disproportionate demands made upon the British by the requirements of their navy, which contributed so largely to the final victory, the operation of their merchant marine, and the maintenance of armed forces in Mesopotamia, Egypt, Palestine and the Balkans. A like criticism applies to most of the material presented in the final pages of the report under the heading "International Comparisons," for here again armies and armaments are compared without reference to the population and wealth of the different countries. While statistician or student of international affairs can readily sense the lack in these statistics and will be protected by his knowledge from erroneous conclusions, to many readers of the report the incomplete comparisons may be actually misleading. It is true that the author is not attempting analysis, but the passages referred to are not satisfactory as description, for the presentation of all significant facts is the first essential of description.

In the chapter entitled "Health and Casualties," which is the most analytical of the report, the difficulties of condensed presentation are most apparent. This chapter begins with a comparison of fatalities per 1,000 men in different armies and in different wars. As no reference is made to the duration of the periods during which the armies were employed nor to the intensity of the fighting, it is not surprising that, in the war with Germany, the losses of foreign armies greatly exceeded those of the American army, and that the loss sustained by the American army in this war fell short of those of the North in the American Civil War. Total losses, without reference to the duration of the fighting, clearly have a marked

social and economic significance; but in this connection losses should be related to total population rather than to military forces.

On page 124 of this same chapter the losses of the American armies per 1,000 men in different wars are compared on an annual basis. This procedure is clearly correct, but the statement is made, in the discussion of the figures, that the losses in the European war were "higher than in the Civil War because all of the fighting was concentrated in one year, while in the Civil War it stretched over four years." It is evident that the effect of the length of the period during which the armies were employed is allowed for by placing the rates upon an annual basis.

The discussion of the control of disease suggests the advisability of a further analysis of the statistical material. From the diagram on page 124, already referred to, it appears that the death rate from disease among American troops was 26 per 1,000, on an annual basis, in the Spanish War, and but 19 per cent. 1,000 in the war with Germany. It is further reported, however, that of the deaths from disease in the earlier war 85 per cent. were caused by typhoid fever, as compared with only one half of one per cent. in the recent war, and the application of these percentages to the reported death rates from disease shows that the rate per 1,000 from disease other than typhoid was 18.9 (19 x [1.000 – .005]) in the war with Germany, as compared with 3.9 (26 x [1.00—.85]) for the Spanish War. It is true that, in the war with Germany, pneumonia, resulting in a large measure from the influenza epidemic which presumably could not have been foreseen nor prevented by the army authorities, caused 83.6 per cent. of all the deaths from disease, the death rate from all diseases other than pneumonia and typhoid being 3.02 per 1,000, a figure lower than that for diseases other than typhoid cited above for the war with Spain. However, deaths from pneumonia doubtless occurred in the Spanish War, contributing to the rate of 3.9, and the pneumonia deaths of the war with Germany cannot all have been the result of influenza—indeed, the report states (page 126) that measles were prevalent during the first of the war and "particularly dangerous as the predecessor of pneumonia." It seems to follow that, except for the elimination of typhoid as an important cause of fatalities, the death rate from diseases may not have been appreciably lower in the war with Germany than in the war with Spain. But the reviewer's analysis is too tentative in character to serve as a basis of conclusions; it is presented as a means of directing attention to the need for a further study of the records.

The clearness and effectiveness of presentation which characterize the report have been achieved, in a large measure, through the employment of seventy-two diagrams and twelve maps. The text discussion is built on and about the diagrams, the tabular statements employed being brief and incidental. In a report dealing, as this one does, with a wide range of subjects, and intended for a popular audience, a long series of diagrams identical in plan would be monotonous. The economy of mental effort resulting from similarity of form is less important than the stimulation of the attention to be obtained through variety. In employing a large

number of different graphical types, the author has applied with fidelity the fundamental rule of graphical presentation which prescribes the inclusion of the zero line. The procedure followed throughout the report of placing figures at the ends of bars of varying length and inserting figures in bars and columns may be open to question from the standpoint of optical effect, but it does not seem that the results are in any case misleading. The presentation of figures upon which graphical representations are based constitutes sound and useful practice. With the exception of those on pages 41 and 42, which fall well below the prevailing standard of execution, the statistical maps are admirable.

The report is, a successful venture in the field of statistical journalism; to quantitative subject matter of current interest the author has imparted proportion and vividness. He has done much in addition to this. Without attempting a complete mapping of the statistical territory created by the war, he has established landmarks which will be of great value to workers concerned with the details of special problems. He has produced, also, a convenient and readable handbook which, as a source of authoritative and definite information about some of the central facts of American participation in the war, will be useful for an indefinite period.

EARLE CLARK.

STATISTICS OF THE INFLUENZA EPIDEMIC.

The subject of statistical study of the influenza epidemic was brought up at a special meeting of this Association held March 28, 1919, at the City Club, New York City. A speaker representing the Vital Statistics Section of the American Public Health Association outlined what had been accomplished by a committee of that organization in planning statistical studies of American influenza data. The speaker indicated the bearing upon modern statistical practice of what had been done for the data of the epidemic of thirty years ago, quoting Leichenstern* as to the contributions which the statistical profession had made to the history of influenza.

"Epidemiologic investigation is much indebted to modern statistics for its progress, to the high development of medical journalism, and to the powers that have been universally brought to bear toward achieving collective investigations and scientific researches."

The German Collective Investigation by Geyder and Guttmann; the exhaustive reports by Parsons (1889–1892); the French Academy report by Proust-Brouardel, and the army report of Kelsch and Antony; the Russian report by Teissier; the Belgian "*enquête sur l'epidémie de grippe*"; the Dutch report of Solomonson and de Rooj; the Danish report by Carlsen; the Swedish by Linroth; the Egyptian by Engel-Bey; as well as the investigation by Abbott (Massachusetts), and for Riga, Cologne and Danzig, were mentioned as types of statistical inquiries providing the pattern for researches into the recent epidemic.

*" Nothnagel's Encyclopedia of Practical Medicine," Saunders, Phila., 1905.

Some statisticians have expressed a doubt that the disease known as "influenza" today is the same disease observed by the collective investigations of thirty or more years ago. A survey of the literature on influenza for the past one hundred years indicates, however, that this doubt has been expressed at the time of each epidemic. In fact, no introduction to a collection of influenza statistics seems to have been complete, in times past, without some sort of observation of this kind.

Continuing, the speaker held that there were, in general, two approaches to the mystery of influenza, the one, an *intensive* inquiry into the clinical, particular aspects of the disease; the other, an *extensive*, statistical collection of facts. It is the function of the statistician to supplement the facts and conclusions of the intensive case-worker, with the broader conclusions drawn from a survey of various groups in the communities affected by the epidemic.

Work upon plans for the statistical, or extensive, study of the epidemic in American communities was begun by the Vital Statistics Section of the American Public Health Association, on November 20, 1918, by the appointment of an emergency committee which met on November 29 and 30, 1918, at the Hygiene Laboratory, University of Pennsylvania, Philadelphia, Pa. The aim of this committee was to secure from the registrars and public health statisticians of the eastern states, a statement of minimum requirements in a programme of statistical study of the epidemic. This programme was submitted to the Vital Statistics Section at its meeting in Chicago on December 11, at which time the recommendations of the committee were considered, and the committee empowered to continue its work.* Further notes on this committee's proceedings are to be found in the March, 1919, QUARTERLY PUBLICATIONS OF THE AMERICAN STATISTICAL ASSOCIATION and in the February, 1919, number of the *American Journal of Public Health*. The remarks of the speaker representing this committee closed with a request that the American Statistical Association lend its encouragement to the thorough statistical study of the epidemic. Only through such collection of materials would there be available a body of epidemiologic data of value in determining the causes, extent, and other characters of the recent epidemic, and the control of future visitations of the disease. Special emphasis was placed upon the need for methods of higher analytic description of the disease—methods developed by the English biometricians and by the French and Scandanavian mathematicians. A suggestion was also made that the epidemic be studied mathematically as a phenomenon in bio-chemistry, making use of the theories of measurement in that science as advocated by Professor Svante Arrhenius and others of the Stockholm School.

President Hill appointed a committee to prepare a resolution which is given below. The members of the American Statistical Association present at the meeting endorsed this resolution in substance.

*" Influenza Bulletin," *Amer. Public Health Association*, Boston, Mass., Dec. 13, 1918.

RESOLUTION.

Whereas, The prevention of future catastrophic invasions of influenzal disease depends in part upon the conclusions which will follow a thorough statistical study of the epidemic and,

Whereas, The advances in statistical and mathematical science in recent years have made it possible to determine more readily the nature, probable causes, extent and perhaps the methods of control of such epidemics, in relation to climate, habitat, race, economic status, and other aspects of the life of mankind,

Therefore Be It Resolved, That the American Statistical Association, at its special meeting held in New York City, March 28, 1919, endorses the work begun by the American Public Health Association, and by other bodies associated with it, in outlining programmes for the tabulation and analysis of influenza statistics by municipal, state, federal and private organizations,

Furthermore Be It Resolved, That the Association urges qualified statisticians of its membership and in statistical societies elsewhere to apply every technical resource of modern statistical science in the study and interpretation of the published influenza data.

Committee on Resolutions:
G. H. VAN BUREN,
F. S. CRUM,
E. W. KOPF (Chairman).

ANENT THE NEW AND THE OLD IMMIGRATION.

Mr. Paul H. Douglas in the June issue of the QUARTERLY has undertaken to answer the question, "Is the new immigration more unskilled than the old?"

"It is commonly stated," he says, "that the newer immigration from Southeastern Europe is more unskilled than the older immigration from Northwestern Europe. This has been challenged by a few writers, *but it has not by any means been effectually refuted.*"

He therefore proceeds to compare the statistics of the old and the new immigration and comes to the conclusion that all the change amounts to is that "the unskilled laborers from the Southeast have displaced the unskilled laborers from the Northwest."

"If this long accepted belief in the higher percentage of skilled workers among the old immigration is, after all, erroneous, why has it been cherished for so long?" inquires Mr. Douglas. And he answers that, among other causes, it is due to "the custom of each generation to view the immigrants of its days as inferior to the stock that once came over."

These are precisely the conclusions which I have reached in my book "Immigration and Labor," referred to by Mr. Douglas. I am chagrined to learn from his article that "impartial students" have been led "to discredit the value of his (my) conclusions." Perhaps the methods by which

Mr. Douglas has arrived at his conclusions differ from those used by me? On pp. 67, 68 cited by Mr. Douglas there are two statistical tables in which the occupations of the immigrants are compared for the half-century, 1861–1910, by decennial periods. It appears that skilled workers constituted 24 per cent. in 1861–1870, 23.1 per cent. in 1871–1880, and a fraction over 20 per cent. from 1881 to 1910, whereas unskilled laborers and farm help combined constituted between 51 per cent. and 57.9 per cent. of all immigrants with occupations.

Mr. Douglas, on the other hand, confined himself to two periods within the same half-century, viz., 1871–1882 and 1899–1909, and found that "skilled workers comprised 22.9 per cent. of the immigrants from the countries from Northwestern Europe, 18.1 per cent. of those from Southeastern." But he considers the difference "not decisive."

Mr. Douglas' discovery encourages me to hope that if other "impartial students" will with the same painstaking efforts recompute some of the statistical tables contained in my book they may concur in his statement that "some of the prejudice against the newer races has not been wholly absent from some of the writings upon American immigration problems."

ISAAC A. HOURWICH.

RESOLUTION OF THE CASUALTY ACTUARIAL AND STATISTICAL SOCIETY OF AMERICA

At a meeting of this Society, held in New York City, May 23, 1919, the following resolution drawn by a special committee appointed by the President of the Society, upon recommendation of the regular Committee on 1920 Census, was unanimously adopted:

WHEREAS: The published results of the forthcoming Census of population, of manufactures, mines, quarries and forestry in the United States, as authorized by the bill enabling the Fourteenth and Subsequent Censuses, will materially advance casualty insurance science, and will help especially to solve numerous rate-making and administrative problems in that science.

Therefore be it unanimously resolved by the Casualty Actuarial and Statistical Society of America that—

1. The statistics of classified wages in the Census of manufactures, mines, quarries and forestry be tabulated to show for the principal industries in the several states the number of employees by one-dollar weekly-wage groups up to thirty-five dollars, and by five-dollar wage-groups thereafter.

2. The statistics of the occupations of the population be classified and tabulated to show in principal states the number of persons in the important specific occupation classes of each significant industry of each State.

3. The classification of "external causes" of death in the International List of Causes of Death, Second Decennial Revision, 1909, be amended to show, in its application to the annual statistics of mortality in the Regis-

tration Area for Deaths, the number of accidental deaths due to (a) domestic hazard, (b) industrial or occupational hazard, (c) public liability hazard and (d) unknown or unspecified hazard, and that such deaths be tabulated by sex and age classes.

4. The statistics of diseases and accidents under treatment in a representative number of hospitals or other institutions be collected by the United States Public Health Service in accordance with an approved, uniform nomenclature and classification of such diseases and accidents, and through voluntary coöperative arrangement between the United States Public Health Service and the several hospitals or other reporting institutions. It is recommended that workmen's compensation and occupational disease cases under treatment be so specified, and the data shown for sex, age, duration of disability and for other items which are in the opinion of the United States Public Health Service of sufficient economic and social importance to warrant tabulation and publication. It is suggested, furthermore, that the data for injuries show not only the means of injury, but also the nature of the injury, *i. e.*, fractures by parts affected, various classes of wounds, infections following injury, etc.

Furthermore be it resolved: That a copy of this resolution be sent to the Director of the Census, to the Surgeon General of the United States Public Health Service, to the Chairman of the Census Committees of the House of Representatives and of the Senate.

CASUALTY ACTUARIAL AND STATISTICAL SOCIETY OF AMERICA.
Special Committee on Resolutions:

W. H. BURHOP (Chairman),
FREDERICK S. CRUM,
LEONARD D. HATCH,
GEORGE D. MOORE,
EDWIN W. KOPF.